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SUPPLEMENT

TO THE

CATALOGUE OF SHIELD REPTILES

IN

THE COLLECTION

OF

THE BRITISH MUSEUM.

PART I.

TESTUDINATA (TORTOISES).

WITH FIGURES OF THE SKULLS OF 36 GENERA.

BY

JOHN EDWARD GRAY, F.R.S. &c.

LONDON:

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1870.

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INTRODUCTION.

THE chief object in preparing this Supplement has been to give an account of the specimens of Tortoises which have been received since the Catalogue was published in 1855, and to embody the various improvements that have been proposed for the arrangement and determination of the species, and particularly to illustrate the characters that are afforded by the examination of the skull and other parts of the osteology of these animals.

The woodcuts are those which were prepared to illustrate the series of papers on the arrangement and determination of the species of these animals first published in the 'Proceedings of the Zoological Society,' and have been kindly lent by the Council of the Society for the purpose.

JOHN EDWARD GRAY.

British Museum, September 28, 1870.

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In the 'Synopsis of Reptiles,' published in 1831, there were described 82 species; in the 'Catalogue of Tortoises,' published by the Museum in 1844, there were described 131 species. The 'Catalogue of Shield Reptiles,' published in 1855, contained the descriptions of 167 species; the present Supplement contains the account of 233 species. In the 'Catalogue of Shield Reptiles' the skulls of 13 species were figured; in this Supplement the skulls of 36 additional species are figured, and many more described.

Dr. Schlegel, in the 'Fauna Japonica' (1838), has written an essay on the geographical distribution of Tortoises, illustrated by a large map, which is very interesting; but, unfortunately, he had an idea that all the species described by other authors which are not in the Leyden Museum are varieties of species which he possesses: thus, for example, he considers *Bellia crassicollis*, *Hardella Thurgi*, *Damonia Reevesii*, *Cyclemys dentata*, and *Nicorea Spengleri* to be the same species, though they even belong to different families, and regards *Kinixys castanea*, *K. Homeana*, and *Chersina angulata* as the same species; which greatly detracts from the accuracy of his conclusions, and the value of his essay and map.

Dr. Alexander Strauch has published an elaborate and very interesting essay on the geographical distribution of Testudinata, entitled "Die Vertheilung der Schildkröten über den Erdbal," in the 'Mém. de l'Académie des Sciences de St. Pétersbourg,' vii^{e} sér. tom. viii. No. 13, 1865, but also published separately. This essay, and a previous one entitled "Chelonologische Studien mit besonderer Beziehung auf die Schildkrötensammlung der kaiserlichen Akademie der Wissenschaften zu St. Petersburg," from the 'Mém. de l'Académie Impériale des Sciences de St. Pétersb.,' tom. v. No. 7, 1862, which contains a *résumé* of the genera and species, had escaped me until all this 'Supplement' was printed; or I would have referred to them. Unfortunately the author seems to have had a very small collection, only 66 species; so that the *résumé* is a very industrious compilation, and the only novelty consists in a change of names, especially in using the genera *Terrapene*, *Emys*, and *Clemmys* in a different sense from that in which they are used in this work; and he has described a species, from the shell without the animal, from California, under the name of *Clemmys Wosnessenski* (tab 1.), which is probably only a variety of *Geoclemmys marmorata*.

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SUPPLEMENT

TO THE

CATALOGUE OF SHIELD REPTILES

IN THE

BRITISH MUSEUM.

Papers on the skulls of *Chelydidæ* and on the skulls of the Asiatic and African species of *Trionychidæ* were read at meetings of the Zoological Society in 1867, and I was enabled to found on the study of their skulls what appeared to me to be more natural arrangements of the species into genera and larger groups. I wished to follow the same plan with regard to the other families of *Testudinata*, but I was stopped by want of material.

The British Museum has since then received some additional skulls and skeletons; and I hope that, with these and with the examination of the heads and mouths of the specimens in spirits and stuffed, I have been able to place the characters of the genera, and to group the genera into sections, on a firmer basis than that hitherto used, and thus to add to our knowledge of these neglected animals.

Anatomists have been content to study the osteology of the three or four larger groups of the Tortoises, and have paid very little attention to the skulls, much less to the skeletons, of the genera or other smaller groups; and very few skeletons or skulls have been figured.

To give some idea of the little attention hitherto paid to the subject and of the difficulty that existed of examining the skeletons and skulls of them, the Museum of the College of Surgeons, when Professor Owen printed his Catalogue of the osteological series in that collection, only contained the skulls or skeletons of five species of *Testudinidæ*, of one of the *Cistudinidæ*, of two *Emydidæ*, and of one of the *Chelydradæ*. I am glad to say that the collection has been lately increased by the addition of several other skeletons and skulls.

To remedy this evil, I have exerted myself to bring together the skeletons and skulls of as many specimens of Tortoises as could be procured for the British-Museum collection; and there are now in that collection 80 complete skeletons, and 60 skulls, besides bones of parts of the body, belonging to 67 species, as follows:—

	Species.	Skeletons.	Skulls.
Testudinidæ	13	22	10
Cistudinidæ	3	5	—
Emydidæ.....	22	24	12
Chelydradæ.....	6	8	—
Chelydidæ	7	6	6
Trionychidæ	12	8	17
Cheloniadæ	3	6	15
Sphargididæ	1	1	—

In my paper on the skulls of *Chelydidæ* (P. Z. S. 1864, p. 128) I divided them into two groups—one having the

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temporal muscles almost entirely covered with a bony case formed of the dilated zygomatic arch, as in the Sea-Turtles (*Cheloniadæ*), and the other with those muscles only covered with skin, and protected externally by a broad band-like zygomatic arch, as in the Tortoises (*Testudinidæ* and *Trionychidæ*); and I observed that the same difference in the form of the skull was to be observed in the genera of the *Emydidæ*; but some genera, as *Geoemyda* and *Cistudo*, like several genera of *Chelydidæ*, are even without any zygomatic arch, the temporal muscles being only covered with skin between the orbit and the tympanic bone as on the temple and crown.

The families may be divided, according to the shape of the temple, thus:—

	Temple bony.	Temple fleshy.
I. Feet clavate. Terrestrial		*Testudinidæ*.
II. Feet palmate. Fluviatile.		
A. Thorax covered with bony plates.		
a. Pelvis free below; sternal shields 8 or 12	*Platysternidæ*.	*Cistudinidæ*. *Emydidæ*. *Chelydradæ*.
b. Pelvis attached to the sternum; sternal shields 13	*Podocephalidæ*.	*Chelydidæ*.
B. Thorax covered with skin		*Trionychidæ*.
III. Feet fin-shaped	*Cheloniadæ*. *Sphargididæ*.	

The horny beak of these animals not only forms a cutting instrument for the separation of the food from the mass, but it also covers the chewing-surface on the sides of the jaws, there being a more or less extended plate on the inside of the jaws for this purpose. In some the surface of the bone and the horny covering is smooth, as in *Malaclemys* and *Chelydra*. In general there are one or more ridges on the upper jaw fitting into grooves in the lower jaw. In the Tortoises and some of the more terrestrial *Emydidæ*, the ridge and groove are simple; in the more aquatic Terrapins (as *Pseudemys* and *Batagur*) they are wider and toothed. Unfortunately, the form of the masticating surface is not to be usually seen in stuffed specimens; so that it is only known in a limited number of species; but I have discovered that by damping the head of the stuffed specimens and very careful manipulation, the mouth may very often be opened without any detriment to the specimen, and the form of the chewing-surface be observed, but not as perfectly as it can be seen in the prepared skeleton. The comparison of the jaws of adult and young specimens of the same species has shown that the form of the alveolar edge is very little if at all altered during the growth of the animal; thus it affords an excellent permanent character. I was misled by the observation of M. Agassiz, in his general characters of the family Trionychidæ, that the lower jaw grows more flattened towards the end (Contrib. i. p. 332); and therefore, when I received some skulls, all nearly of the same shape, from Western Africa, but with differently formed alveolar surfaces, I was induced to think they might perhaps be the old and young of the same species, and figured them probably as such in the 'Proceedings of the Zool. Soc.' 1864, pp. 95 & 96, figs. 16–21; but I have since discovered that the skull with a more flattened alveolar surface belongs to a peculiar species which has the alveolar surface so flattened at all ages. The form of the alveolar surface shows that there is great variation in the habits of the animals, and ought to be studied for the natural arrangement of the groups. I can only regard the notes I have been able to make as the breaking of the sod, and consider that much has to be done before one can arrive at a satisfactory history of the habits and structure of these creatures, and form an arrangement of them consistent with their habits and manners and peculiarities.

The palæontologists and anatomists who have described fossil Chelonial remains have been satisfied to refer them to a few genera, such as *Testudo*, *Emys*, *Trionyx*, and *Chelonia*, which is more extraordinary when we consider the important characters that separate *Hydraspis* from *Emys*, and the great difference in the form of the head. Some of them have the reputation of having a good knowledge of the osteology of the other vertebrate animals; and they and others have shown no disinclination to form genera on osteological characters, some having even gone to the extent of making several genera from different parts of the skeleton of the same animal.

Dr. Bleeker has kindly sent to the British Museum a series of specimens of the Tortoises which he has lately named, but, I believe, not described, in the 'Natuurkundig Tijdschrift voor Nederlandsch Indië,' xiii. 1857, p. 470. I have compared these with the specimens in the British Museum, which I have at various times described. I have done so because I think it is very important that there should be a uniformity between the names used in the British Museum and those adopted in the museums on the Continent, more especially as I am desirous of conforming to the rule of priority, and quite willing to adopt the names used by any Continental naturalist, if they are given and the specimens described before those described in this country.

It is more important that a concordance should be established as regards Dr. Bleeker's species, as I believe that he has sent specimens to several of the larger Continental and American collections.

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I take this opportunity of stating how much I consider myself indebted to Dr. Bleeker's kindness in contributing original typical specimens of these and other reptiles to the Museum, which has enabled me to make the comparisons.

Mr. Theobald (who, from the study of a few local species, ventured to settle many questions of distinctness of species and classification) forms a family for *Manouria*, *Geomyda*, and *Cuora*, under the name of *Geomydidæ*, because the male had a concave sternum,—three genera only allied together by the unimportant character he quotes, the *Emydidæ* being said to have a flat sternum in both sexes (Journ. Linn. Soc. x. p. 10).

Synopsis of the Suborders.

1. **TYLOPODA.** Toes short, entirely enclosed in the flesh of the thick club-shaped foot. Thorax covered with horny shields. Jaws naked. Caudal shields united into one, recurved. Neck retractile. Terrestrial.

2. **STEGANOPODES.** Toes developed, spreading, more or less webbed; claws 5.4 or 4.4, more or less acute. Neck retractile. Pelvis attached to the vertebræ only. Thorax with horny shields. Sternal shields 11 or 12.

3. **PLEURODERES.** Toes developed, spreading, webbed; claws 5.4 or 4.4, acute. Neck contractile. Pelvis attached to the vertebræ and sternum. Thorax covered with horny shields. Sternal shields 13.

4. **TRIONYCHOIDEA.** Toes developed, spreading, webbed; claws 3.3, acute. Pelvis attached to the vertebræ only. Thorax and sternum covered with a soft skin, having an expanded and flexible margin. Beak covered by fleshy lips.

5. **OIACOPODES.** Toes enclosed in a compressed fin; claws rudimentary. The thorax covered with horny shields or a coriaceous skin.

Suborder I. Tylopoda.

Toes short, entirely enclosed in the flesh of the thick club-shaped foot. Thorax covered with horny shields. Jaws naked. Caudal shield united into one, recurved. Neck retractile. Terrestrial. *Land-Tortoises.*

Fam. I. TESTUDINIDÆ.

Skull solid. Orbit complete, lateral, large; hinder edge moderate. Zygomatic arch strong, well developed, united to the ear-bone behind, with a large cavity for the temporal muscle above. Temporal muscles covered with skin or horny plates. Iris without lateral spot.

Testudinidæ, *Gray, Cat. Shield Rep.* 4.
Günther, Rep. Brit. India, 3.
Testudinina, *Agassiz, Contrib.* 446.

Synopsis of the Genera.

Section I. *Sternal shields* 12, *regularly arranged in pairs on each side of the central line. Pectoral plates large, like the others.*

A. *The inguinal plates moderate or wanting; the nostrils in a square fleshy nose, between the upper edge of the beak and the frontal plates; thorax solid.*

* *The alveolar surface of the upper and lower jaws with a distinct submarginal groove.* Testudinina.

1. **Testudo.** Gular plates separate. Claws 5.4. Alveolar plate with two ridges. Lower jaw narrow, with a deep groove extending the whole length of the edge; front of upper jaw with a central notch and two slight prominences.

2. **Scapia.** Lower jaw narrow in front, with a short deep groove as long as the hinder half of the outer margin.

3. **Peltastes.** Gular plates separate. Claws 5.4. Alveolar plate with an indistinct ridge.

4. **Testudinella.** Gular plates separate. Claws 4.4.

5. **Pyxis.** Gular plates separate. The front lobe of the sternum mobile.

6. **Chersina.** Gular plates united and produced.

** *The alveolar surface of the upper jaw with a distinct submarginal ridge, of the lower jaw simple.* Homopina.

7. **Homopus.**

B. *The inguinal plates very large; the nostrils in a notch on each side of the middle of the upper edge of the beak; thorax, hinder part mobile.* Kinixyina.

8. **Kinixys.**

Section II. *Sternal shields* 10, *arranged in five pairs. The two pectoral shields small, short, triangular, far apart, on the sides at the hinder edge of the axillæ.* Manourina.

9. **Manouria.** This genus, before the animal was known, was erroneously arranged in *Emydidæ*.

Section I. *Sternal plates* 12, *regularly arranged in pairs on each side of the central line. Pectoral plates large, like the others.*

Tribe I. TESTUDININA.

Thorax solid. The inguinal plates moderate; the nostrils in a square fleshy nose between the upper edge of the beak and the frontal plates. Front edge of the upper beak keeled or rounded. Alveolar surface of the upper and lower jaws with a distinct submarginal groove.

Gray, P. Z. S. 1869, 167.

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1. TESTUDO.

The skull has a well-developed zygomatic arch. The palate is deeply concave, especially in front; and there are three more or less distinct, narrow, elevated, parallel longitudinal ribs on it behind the internal nostrils, which are placed in front of the palate. The alveolar margin of the upper jaw broad, with two ridges parallel to and as long as the outer margin of the beak. The central ridge is divided into conical teeth; the inner marginal ridge higher and with a more even edge. The nostrils are placed in a more or less square fleshy muffle, which is situated on the upper edge of the horny beak. Lower jaws narrow in front, with a short deep groove as long as the hinder half of the outer margin.

The hinder part of the skull over and near the ethmoid bones varies considerably, and affords very good characters for the distinction of the species.

* *The last vertebral shield almost as large as the caudal and two hinder marginal plates.*

American Gophers, *Gray, Cat. Sh. Rept. B. M.* 5.
Xerobates, *Fitzinger. Agassiz*, 446.
Chilonoides, *Agassiz.*

1. Testudo Gopher. B.M.

Testudo Gopher, *Gray, Cat. Sh. Rept. B. M.* 5.
Xerobates carolinus, *Agassiz*, 447.
Xerobates Berlanderii, *Agassiz*, 447, t. iii. figs. 17–19.
Testudo californica, *Quoy & Gaim. Fér. Bul. Sci. Nat.* i. 1824, p. 90, 91.

2. Testudo tabulata. B.M.

T. tabulata, *Gray, Cat. Sh. Rep.* p. 5 (skeleton).
Wiedemann, Arch. Zool. ii. 181.
Wagler, N. Syst. Amph. t. 6. f. 1–8.
Owen, Cat. Osteol. Mus. Coll. Surg. p. 200. no. 1044 (skeleton with mutilated skull), 1046 (skull?).
Chilonoides tabulata, *Agassiz.*

Var. Testudo boiei, *Wagler, N. Syst. Amph.* t. 6. f. 7–13.
Chelonoides boeii, *Fitz.*
Junior? T. denticulata, *Owen, Cat. Osteol. Mus. Coll. Surg.* p. 201. no. 1045 (skull); not *Green.*

The upper jaw with a high triangular ridge, and the lower with a deep triangular groove with a very high inner edge, parallel to and nearly as long as the short-edged outer margin, only represented in the front of the upper jaw by the broad, deep, central, anterior pit. The upper jaw with a notch on each side of the centre, and the lower with a broad, compressed, conical projection. Palate very deep nearly the whole length, deeper on each side in front, with three laminar ridges, the middle one being the most distinct. The ethmoid bone smooth, without any distinctly raised ridge on each side.

There are a skeleton and two skulls appearing to belong to this species in the British Museum. Length of the skull of the skeleton, from nose to condyle, $2\frac{1}{8}$ inches; width at zygomatic arches $1\frac{3}{8}$ inch. Length of largest separate skull 2 inches 5 lines, width $1\frac{3}{4}$ inch. There is also in the Museum the skeleton of a small but adult specimen of the variety with very deeply sulcated shields. The skulls differ from each other somewhat in the depth, and slightly in the form of the concavity in the palate, and in the strength of the margin on the side of the hinder part of the palate within the temporal muscles. They all three vary in the form of the ethmoid bone: in one it is nearly square, with evenly truncated front edge; in the other two it is more elongated, and the middle of the front edge is more or less projecting in front.

Of the skeleton of a young specimen in the British Museum the skull is well formed: it has the symphysis between the two bones very narrow; the beak has the three anterior notches, and the alveolar ridges or grooves, as in the adult.

A half-grown specimen from Xeberos, obtained from Mr. Higgins, in spirit, has the head black, the crown and cheeks yellow-varied, the two four-sided oblong longitudinal shields on the nose and the small shield edging the upper part of the orbit pure white; a small spot on each temple and a large shield between the orbit and the upper edge of the tympanic cavity yellow.

Among others there are two specimens of South-American species of *Testudo* from the Dutch colonies, proving that there must be two species, which differ in the coloration of the head of the animal and in the general colour of the shell, though the adult shells have been regarded as all belonging to a single species.

This is an instance showing how important it is in distinguishing species to study the animal in all its ages. A species, as in this case, may be very distinct in its young state, and the characters which separate them appear to gradually disappear as the animal increases in age, so that the adult specimens of the two species cannot be distinguished.

In one the shell is dark brown; the margin sharp, entire. Nuchal plate none. Head dark brown; the front of the crown with a large subtriangular spot with rounded angles, surrounded in front by many series of small oblong spots, the front spots (over the nostrils) being the largest; the hinder

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part of the crown with three series of small transverse spots, and with a series of somewhat similar-sized and -shaped spots on each side of the crown. The front and hinder lobes of the sternum narrowed at the end, with straight converging sides.

In the other the thorax is pale yellow; the margin sharp, with small deep notches. Nuchal plate none. Legs dark, yellow-spotted. Head pale brown; two plates over the nose oblong, large, yellow; crown yellow-varied, with rather darker edges to the plates: temple with a large subtriangular oblong spot over the tympanum. The front and hinder lobes of the sternum broad; the sides of the front lobes straight and nearly parallel. The hinder vertebral plate is as wide as the three hinder marginal plates. The hinder lateral marginal plates are small; that is to say, they have the typical characters of the American *Testudines* called Gophers.

Consult Mr. W. Williams, of Tregullow, on the "Breeding of a West-Indian Tortoise in this country" (Proc. Zool. Soc. 1862, p. 266; Ann. & Mag. N. H. 1863, xii. p. 159).

3. Testudo (Gopher) chilensis.

Shell depressed, dirty yellow; middle of the back flattened; areola central; nuchal plate distinct; marginal plates shelving, with a very short keel; front and hinder marginal plates reflexed, making a serrated edge; one pair of supranasals; an hexangular (central) and two triangular frontal plates between the eyes; fore legs with a large spur at the elbow-joint, and numerous conical spines on the underside of the thighs, two of which are larger than the rest.

Testudo chilensis, *Gray, P. Z. S.* 1870, t. .

Hab. Chili.

Very like *Peltastes sulcatus*, but more depressed, and at once known by its broad fifth vertebral plate and narrower marginal plates.

** *The last vertebral generally only as wide as the caudal, and half as wide as each of the hinder marginal shields.* Old World.

Testudo § B, *Gray, Cat. Sh. Rep.* p. 6.

4. Testudo planiceps. B.M.

Testudo planiceps, (skull figured) *Gray, Cat. Sh. Reptiles in B. M.* t. 34.

Skull—length 5¼ inches, width over zygomatic arches 4¼; the alveolar plate in the upper jaw narrower, with a central and marginal ridge, and a groove in the lower jaw the whole length of the margin.

Perhaps the skull of the adult *T. elephantopus*.

† *All black, uniform.*

Megalochelys, *Agassiz*.

5. Testudo indica. B.M.

Testudo indica (skull figured), *Cuvier, Oss. Foss.* v. t. . f.
(copied, *Wagler, N. Syst. Amph.* t. 6. f. 51, 52, 53).
Gray, Cat. Sh. Reptiles in B. M. p. 6, t. 35. fig. 1; *P. Z. S.* 1869.
T. elephantopus, *Owen, Cat. Osteol. Mus. Col. Surg.* p. 194. no. 1011 (skeleton), 1058 (skull).
Megalochelys nigricans, *Agassiz*.

Black; nuchal plate distinct; crown of head very convex.

Skull—length 5¾ inches, width at zygomatic condyles 4½; the alveolar plate in the upper jaw broad, with a central and marginal ridge, and a groove in the lower jaw the whole length of the margin.

There is a skeleton of a small adult specimen of this species in the British Museum.

6. Testudo elephantopus. B.M.

Black; nuchal plate none; crown of head flat.

Testudo elephantopus, *Harland, Journ. Acad. Nat. Sc. Phil.* v. t. .
Gray, P. Z. S. 1870, t. .
Testudo indica (part.), *Gray, Cat. Sh. Rept.*

Hab. Chili; Galapagos.

†† *Dorsal and ventral shields black, yellow-rayed; nuchal plate distinct, elongated.* Africa.

7. Testudo radiata. B.M.

Testudo radiata, *Gray, Cat. Sh. Rep.* p. 9.
Cuv. Oss. Foss. v. 193, t. 12, 13.
Wagler, N. Syst. Amph. i. figs. 1, 2, 10, 37, 40, t. 11 (skeleton).

The skull of the skeleton in the British Museum is solid, heavy, rather longer than wide in the widest part; crown rather convex; nose erect; sides of face concave; orbit large; zygomatic arch strong, broad, convex, about as wide as the small oblong tympanic cavity. Palate very deeply concave in front, gradually shelving off to the ethmoid, with three narrow laminar longitudinal ridges near to-

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gether in the centre of the concavity. Ethmoid bone narrow, with a narrow, linear, rather arched ridge on each side. Lower jaw with a deep narrow groove parallel to and as long as the short outer margin, and with a conical prominence in front. The skull is 2 inches long from the nose to the condyle, and $1\frac{2}{3}$ inch wide over the zygomatic arches, which is the widest part.

The mastoid bone, in the different species of Tortoises, differs greatly in shape; in this species it is short, with a shelving outer surface; it is always hollow, forming a tympanic cavity.

††† *Dorsal and ventral shields spotted; nuchal plate none.*

8. Testudo pardalis. B.M.

Testudo pardalis, *Gray, Cat. Sh. Rep.* p. 9.
Var., *Gray, Ann. & Mag. N. H.* 1863, p. 382.

Testudo pardalis differs from the general ventricose form by being elongated, like the Indian *Testudo stellata*. It is very solid for its size, and the black mark forms rays rather like those in the Indian species above named. There are the head and feet of a *Testudo* in the same collection, in spirits, which are believed to belong to the above shell. They agree with *T. pardalis*, which is peculiar for having the head covered with small scales, and only a pair of rather small thin frontal shields just over the end of the nose.

Hab. Central and Western Africa.

Head with numerous small shields and two larger plates over the nostrils. Upper jaw with a deep broad notch in front and denticulated on the edge; the lower jaw with a recurved hook in front and tuberculated on the outer edge and denticulated on the margin; alveolar surface of the upper jaw with a deep pit in front and a ridge on the sides; the lower jaw with a deep groove extending the whole length of the jaw.

9. Testudo Forstenii.

Testudo Forstenii, *Schlegel, Verhandl.*

Hab. Gilolo.

10. Testudo planicauda.

Testudo planicauda, sp. n., *Grandidier, Rev. et Mag. Zool.* 1867, p. 233.
Zool. Record, 1867, p. 132.
Testudo desertorum, *Grandidier, Guérin's Mag. Zool.* 1869, p. 267.

Hab. Madagascar.

♂. Supra brunneo-nigra; scutorum areolis granulosis ochreis rarisque radiis ab illis divergentibus flavidis; scutis flavo cinctis. Scuto nuchali parvo, caudali unico; secundo tertioque dorsali omnino planis. Infra flava, areolis nigro maculatis. Sterno latissimo, antice paulo longiore testa. Capite brunneo flavis maculis; cauda maxime depressa, extrema parte squamis magnis tecta.

Long. testæ 0·15 m. Madagascar.

2. SCAPIA.

Skull solid, oblong; face broad, rounded in front. The groove on the palate very deep and wide. The upper jaw with three narrow ridges—one on each edge of the margin, and a short thinner one intermediate between them; the outer margin high and without any teeth. Lower jaw with a sharp edge, a rather acute sharp edge in the front part, and with a sharp inner ridge rather more than half the length of the side, separated from the outer edge by a deep groove.

1. Scapia Falconeri. (Fig. 1.) B.M.

Testudo (Scapia) Falconeri, *Gray, P. Z. S.* 1869.

Hab. India? B.M.

Length of skull from nose to condyle $3\frac{1}{2}$ inches; width 2 inches 5 lines, of forehead between orbits $2\frac{1}{8}$ inches; length of outer edge of upper jaw 1 inch 8 lines.

The skull above described was received in Dr. Falconer's collection, which was presented to the British Museum by his brother on his death. It is most probably from India, and perhaps from the mountain-regions. It is evidently the skull of a very large species of the genus and very distinct from *Testudo indica*, the skull of which was figured in the 'Catalogue of Shield Reptiles in the British Museum,' t. 35. f. 1, and the larger *Testudo planiceps*, figured in the same work, t. 34, and only known from a skull in the Museum collection. From its size, it is most probably the skull of one of the Black Tortoises of Asia that have been called *Testudo indica*, which are found spread over all parts of the Asiatic region, also on the islands off the east coast of Africa, and in California and the Galapagos, and of which certain variations in form were regarded by the older writers as denoting distinct species. Modern writers on the subject have united these into a single species under the name of *Testudo indica*.

Testudo Falconeri and *T. planiceps* having been described from skulls in museums, without any knowledge of the thoraces of the animals to which they belonged, I am not able to say if they are identical with any of the Tortoises

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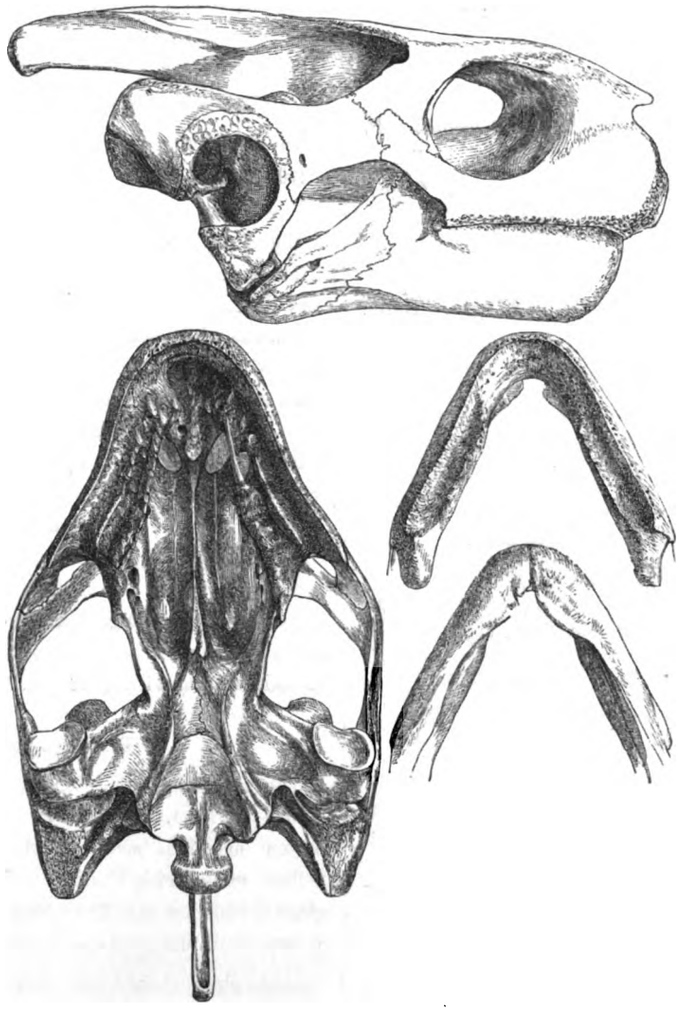
which have been described, from thoraces only, under the names of *T. nigra*, *T. dussumieri*, *T. gigantea*, *T. Vosmaeri*, *T. nigrita*, *T. Daudini*, *T. elephantina*, *T. Perraultii*, and *T. peltastes*. This is one of those instances which ought to teach naturalists caution in determining species without the examination of all the parts of the animal, the skull as well as the thorax.

The Tortoises that have been called *T. indica* are found in India, Africa, and North and South America, or rather on the islands of these two latter continents; and it has been supposed that they have been introduced to these places by ships, as they are sometimes collected and used as food aboard ship. Some say they were introduced into India, and the original habitat of the species is unknown.

Fig. 1.



Scapia Falconeri.

Note.—The figures are all of the natural size, except when otherwise stated.

Perhaps the discovery that there are several species confounded under the name of *T. indica* may solve this problem.

There is a large species of Tortoise from India named *Manouria fusca*, the skull of which has somewhat the general form of that of *Testudo Falconeri*; but the latter differs in having a broad, well-developed zygomatic arch, the arch in *Manouria fusca* being slender and weak.

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3. PELTASTES.

The alveolar surface of the upper jaw rather broad in the hinder part, interrupted in front by a broad concavity over the anterior internal nostril; the broad hinder part with a slightly raised ridge and a similar raised inner edge nearly parallel to the margin of the jaw; the front of the jaws has two slight prominences, separated by a slight notch. Lower jaw slender, weak, with a sharp edge in front, and with a rather deep rounded groove with a very thin inner edge occupying the inner surface of the hinder half of the margin.

A. PELTASTES. *Beak keeled in front, and 3-toothed.* P. elongatus, P. stellatus, and P. platynotus. India.

B. CHERSINELLA. *Beak rounded in front, toothless.* C. geometrica, C. tentoria, C. sulcata. Africa.

* *Dorsal shields with pale rays; nuchal shield none.* India.

1. Peltastes stellatus. B.M.

Thorax ovate, convex; dorsal shield grooved, with nine, fifteen, or more yellow rays; the lateral rays of the costal shields nearly parallel; marginal shields with four or more yellow rays; sternum black or dark brown, with numerous nearly uniform yellow rays; nuchal plate none.

Testudo stellata, *Gray, Cat. Sh. Rept.* p. 7.
T. elegans, *Günther, Rept. Brit. India*, 4; *P. Z. S.* 1869.
T. geometrica, *Hutton, Journ. As. Soc. Beng.* 1837, vi. 689, t. 38.
T. megalo, *Blyth, Journ. As. Soc.* 1865, xxii. 624.

Hab. Scinde (*Dr. Leith*); Ceylon, Himalaya (*Captain Boys*).

Var. 1. *actinoides.* The dorsal shields more or less convex, with fifteen or more yellow rays. B.M.

Testudo actinoides, *Bell, Zool. Journ.* iii. 419, t. xiv., *Testudinata*, t. .
T. stellata, var., *Gray, Cat. Sh. Rept.* 7.

Var. 2. *elegans.* Shields black, with twelve rays; costal shields with eight or nine rays. B.M.

Young. Areolæ of shields brown, large, four- or five-rayed; sternal shields with a pale areola and more or less broad, black, pale-rayed margin.

Testudo elegans, *Schœpf, Testudo*, t. xxv. figs. 1, 2, 3 (copied *Shaw's Zool.* ii. t. vi.).
Schweigger, Prodromus, 86.
T. stellata, *Schweigger*, 56.
Gray, Syn. Rept. 12, t. 1. f. 1.
La Géométrique, *Lacépède*, 137, pl. ix.
Seba, Thesaurus, i. & lxxx. 318.

Var. 3. *maura.* Shell very black; costal shields with six or seven white rays. B.M.

Young. Shields black, with a yellow four-rayed cross on the costal shields. B.M.

Var. 4. *seba.* Shell young; shields yellow; areolæ large, pale, with a black spot on the upper and lower margins and a long spot on the side margin over the suture between the shields; marginal shields pale, with a very narrow dark front margin.

Seba, Thesaurus, i. t. 79. f. 3. B.M.

Schweigger changed the name of the species because he did not believe that the Tortoise figured by Seba was the young of the same species. See 'Prodromus,' 56.

The specimens with many rays and with fewer rays are very distinct from each other, and I have not found any specimens which seem to unite them. I was at one time inclined to regard them as species; but in the British-Museum series of the species are specimens of both varieties sent by the same persons from Ceylon, Himalaya, and Scinde, which makes it appear as if they were found intermixed together.

Schweigger did not consider Schœpf's specimen of the young animal (which is very characteristic of the four-rayed variety) the same as the specimen which he described; and therefore he changed the name to *stellatus*. Dr. Günther refers to Schœpf's figure without doubt, and to Schweigger's *Testudo stellata* with doubt (R. B. I. p. 4).

2. Peltastes platynotus. B.M.

Thorax oblong, flat, with six broad uniform pale rays; areolæ uniform, pale brown; marginal shields with a brown marginal areola, and two pale rays; sternum yellow, varied with black near the front, or hinder marginal shields not rayed; underside of marginal shields with a very small marginal spot on the front edge.

Testudo platynotus, *Blyth, Journ. As. Soc.* xl. 70-79.
Theobald, Proc. Linn. Soc.
T. elegans, var., *Günther, Rept. Brit. In.* 5.

Hab. Burmah.

Blyth describes the flatness of the back as a peculiar character of the species; but it is only to be observed in one out of the three specimens in the British Museum; and he does not mention the plain underside, which is found in them all.

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** *Dorsal shields radiated; nuchal shield distinct.* Africa.

3. Peltastes geometricus. B.M.

Thorax oblong, dorsal plates and upper edge of marginal plate black; areola small, of costal plates submarginal; costal plates with ten or more white rays; upperside of marginal plates with three or more white rays; sternum brown-varied, of the older specimens more or less pale-rayed on the lateral margins; underside of marginal plates pale, with a black streak on the front edge; *nuchal shield elongate, slender*; the vertebral plates more or less convex, sometimes elevated, tent-shaped.

Testudo geometrica, *Gray, Cat. Sh. Rept.* 8.
Peltastes geographicus, *Gray, P. Z. S.* 1869 (misprint).

Var. 1. Shields conical, prominent.

Testudo geometrica, var. tentoria, *Gray, Cat. Sh. Rep.* 8, not *Bell.* B.M.

Var. 2. The margin of the sternal shields black, yellow-radiated. B.M.

Skull short, broad; crown flat, broad, truncated in front; nose-hole very large, square; orbit large, lateral; zygomatic arch slender, rather convex; tympanic cavity oblong, erect; mastoid bone half-oval, hollow, labial edge even, with three slight teeth in front; the palate very concave; the alveolar surface very narrow in front, wider behind, with a very slight submarginal ridge on the hinder part of it. Lower jaw weaker; alveolar edge narrow, with a swollen dentary groove behind, about two-thirds of the length of the outer side of the bone, and with a very slightly raised point in front.

Skull in the Museum of the College of Surgeons, without any number. From the size, probably the skull of *Peltastes geometricus.*

4. Peltastes tentorius. B.M.

The back of the shell black, with twelve or more narrow rays; underside white, with a large brown spot occupying the middle of the whole length of the sternum; underside of anterior and lateral marginal plates white, with a black anterior ray; posterior marginal shields all white; nuchal plate very small.

Testudo tentoria, *Bell, Zool. Journ.* iii. 420, t. xxiii. & xxiv.; *Testud.* t.
T. geometrica nigriventris, *Gray, Cat. Shield Rep.* 8.

5. Peltastes Verroxii. B.M.

Shell depressed, chestnut-brown, broader and slightly dentated behind; dorsal shields with narrow black-edged radiating streaks; areola small, black, and pale-varied; sternum brown, especially in the middle of its length; sternal shields with diverging pale rays, especially on the margin; nuchal shield small.

Testudo Verroxii, *Gray, Cat. Sh. Rept.* 8.

Hab. South Africa.

*** *Dorsal and ventral shields radiated; nuchal shield elongate.* Africa.

6. Peltastes semiserratus. B.M.

Thorax oblong, the hinder margin more or less serrated; dorsal shields black, deeply concentrically grooved; areola pale, large, subcentral, with a pale brown broad radiating band, which sometimes becomes very wide, and often divides into two near the margin of the plates; the central ray of the vertebral and costal plates forms an interrupted streak on the back and sides; the marginal shields with one or two broad pale rays; the sternum white, with a few very broad black rays; nuchal plate elongate, triangular.

Young. Hinder edge very acutely serrated.

Var. Back depressed.

Testudo semiserrata, *Gray, Cat. Sh. Rept.* 9.

Hab. South Africa.

**** *Dorsal shields horn-coloured, black-varied; nuchal plate distinct.*

7. Peltastes elongatus. B.M.

Testudo elongata, *Gray, P. Z. S.* 1856, p. 181, t. 9, 1861, p. 139; *Ann. & Mag. Nat. Hist.* 1861, p. 218.
Günther, Rept. Brit. India, 8.
Blyth, Journ. As. Soc. xxii. 639, xxiv. 7–12, xxv. 448, xl. 75.
Theobald, Journ. Linn. Soc. Zool. 6 (1868).

Hab. India.

Head covered with numerous rather unequal, polygonal, flat, small shields covering the crown, upper part of the orbits, the cheeks, and the sides of the hinder part of the lower jaw; upper beak high, bluntly keeled in front, with three teeth on the front of the cutting edge; lower jaw weak, the sheath only covering the front and half the side edge. The crown with two long, large, oblong shields over

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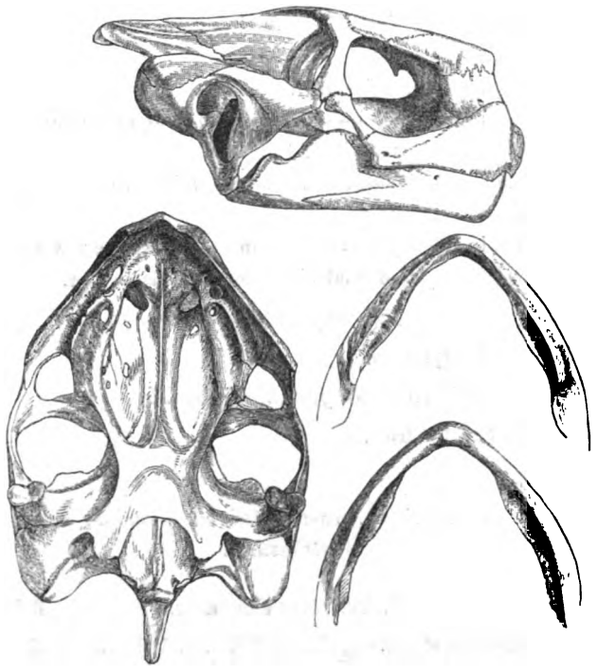
the nose, and a triangular frontal plate as wide as the back edge of the frontal shields, with a narrow plate on each of its back edges, with a large temporal shield over the tympanic cavity, and a triangular one between it and the back edge of the orbit.

Described from a skull in spirits, just received from Mr. Theobald.

There are two skulls of this kind in the British Museum, the smaller sent by Professor Oldham with the thorax, which proves it to be the skull of *P. elongatus*; the larger one was presented by the brother of Dr. Falconer, on the

Fig. 2.



Peltastes elongatus.

death of the Doctor. The larger skull (from Dr. Falconer) is $2\frac{1}{3}$ inches long, $1\frac{5}{8}$ inch wide; the other (from Professor Oldham) is 1 inch 11 lines long, and $1\frac{1}{2}$ inch wide. The thorax has all the characters of *Testudo*. Claws 5.4. The nostrils in a fleshy disk, with a slight notch in the upper edge of the beak, directly under and partly enclosing them; palate deeply concave nearly the whole length, with three laminar longitudinal ridges in the centre of it; ethmoid bone flat, with a more or less distinct raised marginal edge.

Young specimen in spirit, from Pegu, obtained from Mr. Theobald:—Thorax oblong, hemispherical, rather convex, dull brown; centre of dorsal shield blackish; sternum yellow, black in the centre; nuchal shield short, square; the four lateral hinder marginal shields produced into an acute point behind; the caudal shield broad, with a straight denticulated hinder edge with a longer acute point at each end; legs and feet very dark olive.

Hab. Pegu (*Theobald*).

This tortoise is very variable in colour; some older shells are nearly uniform in colour, some others are nearly black, with a more or less pale edge to the dorsal and ventral shields; others are pale whitish, with a more or less broad black ring round the areola.

8. Peltastes? marginatus. B.M.

Caret, *Spix, Cephal.* t. 4. f. 12–15 (skull).
Testudo marginata, *Gray, Cat. Sh. Rept.* 11.
Peltastes? marginatus, *Gray, P. Z. S.* 1869.

Hab. South of Europe.

Male or var. *melas*.

Testudo marginata, *Schoepf's Testudina*, t. xi. & xii.

A very fine and adult specimen in the British Museum, obtained from Mr. Parry, from Greece, is oblong, very solid, black, with more or less large white spots on the areola of each plate, and a triangular spot on the hinder upper half of the lateral marginal plates, more or less white-varied; the hinder marginal plates are very broad, expanded, and spread out behind; the underside of the marginal plates is white, those of the front and hinder margins are edged with black; the sternum is concave in the middle, shelving on the sides, more or less white, varied with white towards the hinder edge; the hinder lobe is narrow, square, notched out behind; the anal plates nearly as wide as the abdominal; the front lobe is small, semicircular; the gular plates thick, white, slightly notched in front; the humeral plates very convex, swollen; the pectoral plates rather narrow, with the front edge nearly straight, and the hinder concave on the sides. Length, over the back, 12 inches; caudal and the other posterior marginal plates $1\frac{1}{2}$ inch wide; the sternum $8\frac{1}{2}$ inches long; hinder lobe 3 inches wide. Adult male.

Testudo marginata (specimen *a*), *Gray, Cat. Sh. Rept.* 11.

Hab. Greece.

There is a second specimen, without the sternum, with

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the hinder margin not so much produced, and the white on the lateral marginal plates more distinct. This specimen is somewhat like *Testudo græca*, Linn., Schoepf's Testud. t. ix., but it is not quite so yellow.

Female or var. *Whitei*.

Testudo Whitei, *Bennett in White's Selborne*.

A fine adult shell, with the hinder margin moderately expanded, and the caudal shield bent down and slightly inflexed; the sternum flat, the hinder lobe tapering behind, the anal shields being not more than two-thirds the width of the shields before them; the pectoral shields very short, not above one-fourth the length of the abdominal shields on the inner half, the outer half about double the width and square; the dorsal shields black; the areola varied with yellow; the hinder upper half of the marginal plates varied with yellow; the underside is yellowish white, with a few irregular unequal-sized black spots. Adult female. The tortoise was described in White's 'Selborne,' and presented to the Museum in 1858 by Mrs. Christopher, niece of Mr. White.

9. Peltastes Leithii. B.M.

Shell broadly ovate, broader posteriorly than anteriorly, very convex above, especially on the hinder half; the lateral margins straight, slightly convergent. Its greatest width is rather more than its greatest depth, which is one-half of its length. *The convexity of the upper shell extends to the caudal plate only, which is almost flat and inclined outwards, so that the outline between the last vertebral and the caudal is concave. The upper shell is deeply notched anteriorly.* The sternum is truncated in front, and has a shallow, obtuse-angular incision behind. Posterior margin of the shell slightly serrated.

The plates are rather smooth, with the concentric striæ distinct. The areolæ of the three anterior vertebral plates are near the posterior margin. Nuchal plate triangular, pointed in front; the last vertebral as broad as the caudal; the two gular plates together broader than long, the sum of their posterior angles being nearly equal to a right angle; abdominals as long as pectorals, postgulars, and gulars together; the suture between the anal plates as long as their posterior margin; inguinal and axillary plates of moderate size.

Tail formed by twenty-two vertebræ.

Feet.—Claws 5.4, obtuse; the front of the forearm is covered by about fifteen large, smooth, imbricate, obtusely pointed scales, in five transverse series of three each.

Colour yellow, each of the vertebral and costal plates with a black margin in front and on the sides, but without black on the hinder margin; each marginal plate with a black margin in front; sternum entirely yellow, with a broad cuneiform longitudinal black band in the middle of each abdominal plate.

Fig. 3.

Fig. 4. Fig. 5.

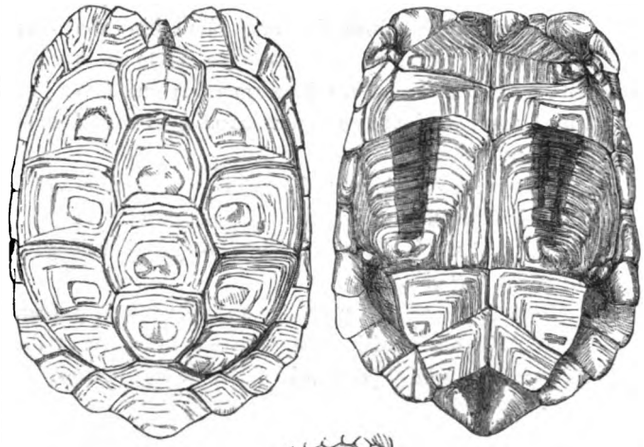

Fig. 6.

Peltastes Leithii.

Fig. 3. Side view; half nat. size.
4. Upper view; half nat. size.
5. Lower view; half nat. size.
6. Fore foot; nat. size.

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The shell of the single specimen, obtained in Sindh, is 4¾ inches long. Also the limbs and the skull are preserved.

Testudo Leithii, *Günther*, *P. Z. S.* 1869, pp. 502, 503, f. 1–4.

I can see no difference between this and a young specimen of *Peltastes marginatus* in the British Museum, except that the shell is brighter-coloured; but the specimen of the latter was in confinement. I keep them distinct because it is possible the adult may be different, as Dr. Leith assures me that he never saw a Tortoise in Sindh like the adult *marginatus* from Greece.

10. Peltastes græcus. B.M.

Testudo græca, *Gray*, *Cat. Sh. Rept.* 10.
Peltastes græcus, *Gray*, *P. Z. S.* 1869.

Skeleton in the British Museum. Skull thin; the upper alveolar edge with a regular groove parallel to the margin, with a sharp ridge on the inner margin; the lower jaw with a regular triangular groove parallel to the whole of the lateral margin.

There are two skulls in the British Museum received from Mr. Yarrell as the skulls of *Testudo græca*. They are evidently of a very distinct species; they both belong to the genus *Peltastes*.

There is a very pretty specimen (young) of *P. græcus*, in spirit, in the British Museum, from the valley of the Minder, Asia Minor, presented by Mr. R. MacAndrew.

***** *Dorsal shields horn-coloured; nuchal shield none; marginal shields very high.*

11. Peltastes sulcatus. B.M.

Testudo sulcata, *Miller*.
Gray, *Cat. Sh. Rept.* 9.
Peltastes? sulcatus, *Gray*, *P. Z. S.* 1869.

Hab. Africa.

Skeleton in the British Museum. Skull imperfect, the nose and lower jaw having been crushed; but from what remains I suspect that it belongs to the genus *Peltastes*.

The skull is high and short, rather like the skull of *Testudo indica*. The central ridge on the palate is very high and laminar, much higher than the ridge on each side of it; zygomatic arch broad and short and convex; tympanic cavity imperfect behind; the mastoid bone is large and entirely hollow, forming a tympanic cavity. Length of skull from nose to condyle 2⅓ inches; width at zygomatic arches 2 inches.

4. TESTUDINELLA.

Head covered with large thin plates on the nose and crown, with small polygonal scales over the orbits, nape, and temples. Horny sheath of the upper jaw rather high, with a deep broad notch in the upper edge of the front of the nose-disk, keeled in front. The dental edge acute, with a notch on each side and an acute keeled central lobe. Lower jaw rather strong, with a sharp denticulated dental edge and a rounded prominence in front. Alveolar surface with a small pit in front and a deep groove parallel to the whole outer margin; of the lower jaw with a distinct and narrow ridge on the inside extending nearly the whole length of the outer margin of the jaw. Skull with a slender, short, scarcely prominent zygomatic arch, much narrower than the orbit or the tympanum. Thorax hemispherical, with a distinct nuchal shield. The fore legs covered with thick, large, triangular scales. Toes 4 . 4. Iris simple.

Homopus, sp., *Blyth*.

1. Testudinella Horsfieldii. B.M.

Testudo Horsfieldii, *Gray*, *P. Z. S.* 1861, p. 214; *Cat. Sh. Rept.* 7, t. 1.
Günther, *Rept. Brit. India*, 7.
Homopus Burnesii, *Blyth*, *Journ. As. Soc.* xxii. 1854, p. 641.

Hab. Afghanistan. B.M.

5. PYXIS.

Pyxis, *Gray*, *Cat. Sh. Rept.* 14; *P. Z. S.* 1869.

Skull small, thin; crown convex, arched; nose-hole very large, with a deep oblong notch in the upper edge; orbit very large; side of face shelving; the hinder edge of the orbit very thin; zygomatic arch very slender, short; tympanic cavity small, oblong, erect. Lower jaw slender. Beak of upper jaw with a straight edge, and entire in front. The alveolar edges narrow, parallel, linear, simple; internal nostril like external. The thorax is very like that of some of the varieties of *Peltastes stellatus*, which is a very variable species both in size and surfaces; so that one might almost regard it as only a variety of it. The sternum is divided by a straight suture between the second and third pairs of plates; the second pair large, with a straight posterior edge. The abdominal or the fourth pair of plates very large; the first or gular plate small, narrower than the small anal ones.

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1. Pyxis arachnoides. B.M.

Pyxis arachnoides, *Gray, Cat. Sh. Rept.* 14.

Var. *oblonga*. Skeleton in the British Museum, received from Leyden. It is exactly like the oblong specimens figured by Duméril and Bibron, Erp. Gén. t. 13. f. 2.

6. CHERSINA.

Chersina, *Gray, Cat. Sh. Rept.* 12; *P. Z. S.* 1869.

Back edge of the orbit thin; zygomatic arch short, rather slender from the middle part of the back edge of the orbit; tympanic cavity small; nose-hole large, square; nostril in a small granular disk; orbit large, lateral; upper beak keeled, with three anterior teeth, with a deep notch in the upper edge for the nose-disk. Lower jaw weak, the beak with a short central hook. The alveolar surface of the upper jaw linear, rather wider behind, with a very short central ridge. Lower jaw sharp-edged in front, rather wider on the hinder half of the margin, with a middle groove for the ridge on the upper jaw.

1. Chersina angulata. B.M.

Chersina angulata, *Gray, Cat. Sh. Rept.* 12; *P. Z. S.* 1869.
Testudo angulata, *Owen, Cat. Osteol. M. C. S.* 201. n. 1050 (skeleton), 1051 (skeleton of trunk and extremities).

Skeleton in the British Museum.

"Head of young black-brown above, with a small white spot over each nostril, a white streak over each eye to the temple, and a large round white spot on each side of the crown, with a streak behind, and sometimes confluent, with the hinder part of the spots rather diverging from each other on the occiput; side of the head dark, with a very narrow white streak from the nostril to the front edge of the eyes, and two narrow streaks on the temple; chin, throat, and sides of the neck pale, with some dark streaks. —*Gray, P. Z. S.* 1866, p. 306.

Hab. Cape of Good Hope.

Tribe II. HOMOPINA.

The thorax solid. Inguinal plates none. The nostrils in a square disk in the upper edge of the upper beak. The alveolar surface of the upper jaw with a distinct submarginal ridge; of the lower jaw simple. The front edge of the upper beak keeled on the central line. African.

7. HOMOPUS.

Homopus, *Gray, Cat. Sh. Rept.* 11.

Head of *Homopus areolatus* covered with small scales, with a pair of plates forming a large shield over the nose. Nostrils high up, in a small square disk situated in a deep notch in the upper edge of the upper jaw. The horny sheath of the upper jaw very high, covering all the side of the face from the angle of the mouth and front of the orbit. Edge acute, with a sharp central hook. Horny sheath of the lower jaw very large, convex beneath, with a sharp edge and an acute central hook. Alveolar plate of the upper jaw with a deep circular pit in front, and with a groove with a sharp ridge on the inside, parallel to the whole lateral edge of the jaw; of the lower jaw with a sharp edge without any groove.

1. Homopus signatus. B.M.

Homopus signatus, *Gray, Cat. Sh. Rept.* 11.

Hab. South Africa; Abyssinia (*Blanford*).

2. Homopus areolatus. B.M.

Homopus areolatus, *Gray, Cat. Sh. Rept.* 11.

Hab. South Africa.

Tribe III. KINIXYINA.

"Thorax, hinder part mobile. The inguinal plates very large. The nostrils in a notch on each side of the upper edge of the beak. The front edge of the upper beak keeled on the central line."—*Gray, P. Z. S.* 1869.

8. KINIXYS.

Kinixys, *Gray, Cat. Sh. Rept.* 12; *P. Z. S.* 1863, & 1869, p. 174.

A. *The front lobe of the sternum narrowed and tapering in front, with a small truncated pair of gular shields; the sides of the margin even; nuchal shield distinct.* Kinothorax.

1. Kinixys Belliana. B.M.

Kinixys Belliana, *Gray, Cat. Sh. Rept.* 13.

Sheath of the upper jaw very high, with the nostril in a notch in its upper edge, between it and the front edge of

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the frontal shields; of lower jaw high, convex in front. Zygomatic arch (as seen through the skin in the stuffed specimen) convex, narrow, from the back of the orbit to the upper front part of the oblong tympanic cavity.

Hab. Abyssinia, at an elevation of 4000 feet (*Blanford*)

There is a very young specimen in the British Museum, collected by Mr. W. T. Blanford in the Anseba valley, in Abyssinia, at 4000 feet elevation. It does not show any indication of the hinder dorsal suture. The areola of the dorsal plates is very large and punctated. The nuchal plate well developed. The head with two large supranasal shields and two frontal shields between the hinder part of the orbits, not quite so long as the supranasals. The rest of the head is covered with small scales.

B. *The front lobe of the sternum broad; side spread outwards, with a large pair of gular shields produced at the outer angles; the sides of the margin strongly dentated.* Kinixys, *Gray, P. Z. S.* 1863.

* *The fifth vertebral plate rounded; nuchal shield none.*

2. Kinixys erosa. B.M.

Kinixys erosa, *Gray, Cat. Sh. Rept.* 13; *P. Z. S.* 1863.
Cope, Proc. Nat. Sc. Phil. 1859, p. 294.
Kinixys denticulata, *Hallowell, Journ. Acad. N. S. Philad.* vol. viii. 161, t. 8, 9.
Duméril, Archiv. Mus. tab. .

Hab. Liberia, on shady banks of rivers. Gaboon; Mozambique.

** *Fifth vertebral plate produced, angular; nuchal shield distinct.*

3. Kinixys Homeana. B.M.

Kinixys Homeana, *Gray, Cat. Sh. Rept.* 13; *P. Z. S.* 1863.

Hab. Central Africa.

4. Kinixys Spekii. B.M.

Kinixys Spekii, *Gray, Ann. & Mag. N. H.* Nov. 1863, 381.

Shell oblong, rather depressed, pale brown; the dorsal and upper part of the marginal plates yellow, deeply and distinctly concentrically grooved, with a black spot on the areola of each shield; the areola of the dorsal plates subcentral, small, granular; of the marginal plates small, rather behind the middle of the shields; the nuchal plate distinct, oblong-elongate; the sternum flat, convex on the sides, yellow, varied with numerous black-brown rays, which reach nearly to the margin; the anterior part of the sternum rather produced and truncated in front, the gular plates being short and rather small; the hinder end of the sternum short and rounded, and slightly nicked in the middle.

Near *K. Homeana*; perhaps a variety.

Hab. Central Africa.

"We have recently received from Western Africa several specimens of the genus *Kinixys*, and they all tend to prove the distinctness of the three species in the 'Catalogue of Shield Reptiles in the British Museum,' viz. 1. *K. Belliana*, 2. *K. erosa*, and 3. *K. Homeana*. *K. Belliana* is easily separated from *K. erosa* (as well as by other characters) by the small size of the gular plates. It would appear that this species is common both to West and Eastern Africa, as Mr. Whitfield brought it from the Gambia, Dr. Peters found it in Mozambique, and Dr. Rüppell at Shoa; so also is *K. Homeana*; for Lieut. Friend found it at Cape Coast in West Africa, and Mr. Berthold on the east coast of Africa.

"The *K. erosa* seems to be common in several parts of West Africa. It is abundant at Gaboon, and seemingly not uncommon at the Gambia. It is a very variable species, but always to be distinguished by the reflexed and strongly dentated posterior margin, and the large size of the gular plates. It varies in form. Some specimens are oblong-elongate, narrow, as wide before as behind (that is to say, straight on the sides): these, as the older specimens have the sternum concave, which we generally consider the peculiarity of the male sex, are probably male. Others are ovate, much broader compared with their length, and broader behind than before, and the sides of the back are more convex: these are probably the shells of females. The specimens of both these shapes are varied with yellow on the upperside of the costal plates, and have short irregular yellow rays at the outer angle of the costal and vertebral shields; but the distinctness of these coloured rays varies in the different specimens. The form of the gular plates also varies; they are always rather large, and the front outer angles are rather produced forward, leaving a deep angular notch; but in one specimen, which has a concave sternum, and is probably an old male, they are very much enlarged, and produced beyond the upper edge of the thorax. They are longer than broad, and truncated in front, so as to present a straight margin without any notch; they are as long as the humeral plate at the inner

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side, and the front margin of them is as broad as the length of the outer side, which is concavely turned out. There seems, from M. Auguste Duméril's figure, to be only a thorax, without any sternum, of this species in the Paris Museum."—*Gray, P. Z. S.* 1863.

Section II. *Sternal shields* 10, *arranged in five pairs. The two pectoral shields small, short, triangular, far apart, on the side of the hinder edge of the axillæ.* Manouriana.

9. MANOURIA.

Manouria, *Gray, Cat. Sh. Rept.* 15 & 77.
Teleopus, *Leconte*, 1854.

The stuffed specimen shows that the skull is oblong, forehead flat, face short; orbit large, lateral, rounded; zygomatic arch weak and thin, compared with the same bone in *Testudo*; the tympanic bone surrounding the ear is deep-seated; the mastoid is not prominent as is usually the case in Land-Tortoises.

1. Manouria fusca. B.M.

Manouria fusca, *Gray, Cat. Sh. Rept.* 16.
Manouria emys, *Theobald, Journ. Linn. Soc.* x. 10.
Testudo Phayrei, *Blyth, Journ. As. Soc.* xvii. 56, xxiii. 639, xl. 77.

Hab. Aracan and Tenasserim.

"In the 'Proceedings' of this Society for 1852, p. 133, I described, and in the quarto 'Catalogue of the Shield Reptiles in the Collection of the British Museum' I described at greater length and figured, the imperfect shield of a Tortoise which had long been in the possession of the Society, under the name of *Manouria fusca*.

"Dr. Cantor, in his 'Catalogue of the Reptiles of the Malayan Peninsula,' describes a specimen of the same Tortoise under the name of *Geoemyda spinosa*, considering it as the adult of that curious and interesting species, and most unjustifiably copies my description of the animal of that Tortoise as that of the animal belonging to the shell which he was describing.

"Dr. Cantor sent the specimen here referred to to the East-India Company, and it has passed from them into the Collection of the British Museum, so that there can be no doubt about the identity of the two animals.

"Mr. Le Conte, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' for October 1859, vol. vii. p. 187, describes a Tortoise from Java under the name of *Teleopus luxatus*, which evidently belongs to the same genus, and is probably the same species which I had previously described and figured under the name of *Manouria fusca*.

"When I first described the genus from a shell in a very imperfect condition, I referred it to the family *Emydidæ*, on account of its 'depressed form and the divided caudal plate.'

"Dr. Cantor, in the Catalogue above quoted, not only refers it to that family, but considers it a species of the genus *Geoemyda*, and describes the animal as having the feet of that genus, which are provided with strong, separate toes.

"Mr. Le Conte seems to have had a perfect animal, for he describes the feet thus:—'Toes and claws 5.5; fore claw long and rather sharp: hind feet clavate; claws nearly globular, the inner one wide and flat, the edge sharp-edged:' yet he places the genus *Teleopus*, in his arrangement published in the same volume of the 'Philadelphia Proceedings,' between *Platysternon* and *Lutremys* with the true *Emydes*, observing that 'it possesses a strong mixture of the characters of this family with those of the next.'

"The British Museum has just acquired from Mr. Gould a very fine and perfect specimen of the genus, which he received with a series of skins of Kangaroos and other Australian mammalia and reptiles from Australia, thus enabling me to lay before the Society a completion of the character of the genus before established from the examination of an imperfect specimen of the shell alone, to correct the position of the genus in the order, and to show the geographical distribution of the single species on which it is founded.

"The genus *Manouria* is a typical Land-Tortoise (*Testudinidæ*), which verifies the fact stated by Dr. Cantor, that it is 'found on the great hill at Pinang, at a distance from water.' Like the other genera of that family, it has very short toes on both the hind and fore feet, which are all united together into a club-like foot, with only the claws separate,—very unlike the distinct, more or less webbed toes of the Freshwater Tortoises or *Emydidæ*, with which it has been hitherto united. Its fore feet are covered with very large, thick, triangular scales, like the feet of the genus *Kinixys*; and it has the spur-like conical scale, situated between the hinder thigh and the base of the tail, which is found in several genera of this family.

"It is easily known from all the other genera of the

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Emydidæ, and from the more terrestrial genera of the family, by the small size and position of the pectoral plates and the divided caudal plate.

"The pectoral plates in some genera of the Freshwater Tortoises, as in *Kinosternon* and *Sternothærus*, are smaller than the other plates, and narrowed on the inner edge; but I do not know of any genus where they are reduced to such a small size and removed so far towards the outer edge of the sternum as in the one under consideration.

"The separation of the caudal plates, which is universal in all the Freshwater Tortoises and Marine Turtles which have come under my examination, is not found in any other genus of Land-Tortoises that I am aware of: but in several species of the true *Testudines* there is a more or less distinct groove, showing where the plates are united; and in *Manouria* they are quite separate.

"The head is covered with symmetrical small shields. The jaws are crenulated on the edge, without any distinct sharp hook at the top of the upper one. The neck is covered with small granular scales. The fore feet are depressed, club-shaped, covered with large, thick, triangular, sharp-tipped shields, forming five rather irregular rows on the front or upper surface. The outer side of the under surface and the soles of the fore feet are covered with large flattened plates. The fore claws are five in number, large, thick, conical, acute, and nearly of an equal size, the outer one being rather the smallest. The hind feet are large, with four very large, strong, conical, acute claws, the outer one on each foot being rather smaller than the others, which are all of equal size. The soles of the hind feet are covered with large, unequal-sized scales—those on the hinder edge being largest—thick, conical, trihedral, and prominent.

"On each side of the hinder part of the body, near the tail, is a group of large triangular scales,—the hindermost, nearest the base of the tail, being very large, conical, and prominent, forming a large spur.

"Tail short, conical, with three rows of flat shields above, and three or four rows of squarer, smaller ones beneath.

"The *Manouria fusca* appears to inhabit Pinang, where Dr. Cantor says it is 'found on the great hill at Pinang at a distance from water;' also Java, as I cannot discover from Mr. Le Conte's description that there is any specific difference between his *Teleopus luxatus* and my species from Pinang; and likewise Australia, for the specimen which we have received from Mr. Gould is marked the 'Murray-River Tortoise,' and it came with a collection of the skins of mammalia and reptiles which are all Australian. There is very little difference between the three specimens of this Tortoise which we have in the British-Museum Collection, two of them from Pinang and the other from Australia. They vary a little in the size and form of the pectoral plates, and in the size of the axillary and inguinal plates, but not more than is the case with other Tortoises of the same species."—*Gray*, *P. Z. S.* 1860; *Ann. & Mag. N. H.* 1861, vii. 215.

Suborder II. Steganopodes.

Toes developed, spreading, more or less webbed, claws 5.4, 4.4, more or less acute. Neck retractile; pelvis attached to the vertebræ only. Thorax with horny shields. Sternal shields 11 or 12.

Emydidæ, *Gray*, *Proc. Zool. Soc.* 1855, p. 197.
Terrapins or Freshwater Tortoises, *Gray*, *P. Z. S.* 1869, 174.

After a patient examination of the skulls and skeletons and a revision of the specimens of the Freshwater Tortoises, or Terrapins, in the British Museum, which have hitherto been referred to the family *Emydidæ* as defined in the 'Catalogue of Shield Reptiles in the British Museum,' published in 1855, I think they may be more conveniently divided into seven very natural groups, which may be called families.

"The knowledge of the animals of our own country is progressive and only gradually acquired; and how much more must it be so as regards the species which we receive from a distant country, whence we get only isolated specimens, and often in a more or less imperfect condition, without any account of how they live, and what they eat, and in what manner they conduct themselves!

"In such cases how can we do more than guess at what is a species, and into what groups the species should be divided? and yet, because we doubt in what we are doing (and the older we become in the study, the more do we see the necessity for doubting, and the more do we see the imperfection of our materials)—yet, on the doubts which arise from such causes and not from any want of faith in the principle that species are permanent, if we only had materials enough to study them properly, do theorists wish to support the theory that species gradually pass into each other, and have been derived, or rather have originated, from such transformations. Never was a theory more baseless, as far as our knowledge is concerned.

"This imperfection of our knowledge is specially the case with respect to exotic Tortoises, where we sometimes only

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procure the shell, at other times the animal with the shell in a more or less perfect condition; and when the latter is procured, we find that the conclusions that we had come to as regards the probable form of the animal, or some part of it, are more or less incorrect, and we are thus obliged to reconsider the situation the species occupies in the series.

"There is no character that an animal offers that is not worthy of study; and my attention has lately been called to the eyes of the freshwater Tortoises, and they have afforded me some information which I believe important. All the paludinal Terrapins which I have been able to examine have a large square dark spot on each side of the iris. This spot, with the pupil, forms a dark band across the eyes. I have observed this to be the case in the species of *Emys*, *Pseudemys*, and *Chrysemys*; and on looking at Holbrook's 'North-American Herpetology,' where the animals are all figured with care from life, we find that he represents and describes all the North-American species of *Emydes* as having this band across the eye. I may observe that I have also seen it in a South-American Tortoise, which I have called *Geoclemmys annulata*; and I think it is also found in *Testudo scabra*, another tropical American Terrapin with separate toes. These animals have been called *Rhinoclemmys* by Fitzinger. They are probably a natural genus, characterized by this peculiarity in the eyes. All the American species of *Geoclemmys*, the two species of *Cistudo* figured by Holbrook, the æstuarian Terrapin *Malaclemmys*, the aquatic Box-Tortoises *Kinosternon* and *Aromochelys*, and the Lacertine Terrapins *Chelydra* and *Macroclemmys* have an annular iris without any interruption. It will be interesting to observe the eyes of the Asiatic and European species; but this can only be relied upon in living specimens, as the spot on the angle of the eye is not to be observed in the specimens preserved in spirits, where only the circular pupil is distinctly marked even in the American *Emydes*.

"When this paper was read at the Zoological Society, it was observed that the Tritons and Toad had the same peculiar spot on the sides of the iris, and that it was common to the Batrachia. This is a mistake; the European and North-American species of *Bufo*, *Rana*, *Hyla*, and *Hylodes* have an oblong-transverse pupil, with an oblong ring-like iris, the upper portion of which is often differently or more brightly coloured than the lower; but this form of pupil is not universal in the tailless Batrachia; for, according to Dr. Holbrook, the genus *Scaphiopus* has a small circular pupil, and the iris divided into four equal parts by black radiating lines. According to the figures of the same author, who had all the species figured from life, the North-American Salamanders and Tritons, the *Amphiuma*, *Menopoma*, *Siren*, and *Menobranchus*, all have small circular pupils, with an annular iris. The *Triton cristatus* of England, *T. marmoratus* of Spain, and *T. alpestris* of Germany have a circular ring-like iris; and the only Batrachians which appear to have the spot on each side of the iris, forming a band across the eyes, are the English *Lophinus punctatus* and *L. palmatus*, the band on the eyes looking in these like a continuation of the dark streak on the side of the head. I may add that the best character for the distinction of these two species, which are often found in the same pond, is, that in *L. punctatus* the crest of the male is scalloped on the edge, and high in front; while in *L. palmatus* it is low in front, and higher behind, and has a smooth straight upper edge. The tail of the latter is also always truncated, and usually appendaged at the tip."—*Gray, P. Z. S.* 1863.

Synopsis of the Families.

I. *The temporal muscle covered with skin, and generally protected by a narrow band-like zygomatic arch.*

A. *Alveolar surface of the upper jaw linear, with the inner margin more or less raised.*

1. **CISTUDINIDÆ.** The sternum united to the thorax by a cartilaginous lateral suture, and divided transversely into two moveable portions.

2. **EMYDIDÆ.** The sternum united to the thorax by a bony symphysis, solid, and covered with 12 shields. Toes short and strong, more or less webbed.

B. *The alveolar surface of the jaws broad.*

a. *The sternum united to the thorax by a bony symphysis and covered with twelve shields. The toes more or less webbed.*

3. **MALACLEMMYDÆ.** The alveolar surface of the jaws smooth. Toes short and strong. Cavity of the shell not contracted at the ends.

4. **PSEUDEMYDÆ.** Alveolar surface of the upper jaw with a submedian ridge parallel to the margin. Toes short and strong. Claws well developed. Cavity of the shell simple. Iris with a spot on each side.

5. **BATAGURIDÆ.** Alveolar surface of the upper jaw with one or two strong submedian ridges parallel to the margin. Toes elongate, slender, weak, broadly webbed. Claws small. Cavity of the shell contracted at each end.

b. *The sternum united to the thorax by a bony symphysis, covered with from 7 to 11 shields; the middle portion fixed to the thorax; the front and hinder portions often separated from it by a transverse suture and moveable.*

6. **CHELYDRADÆ.**

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II. *The temporal muscle covered with a bony hood formed by the extension of the zygomatic arch. Head very large. Sternal shields* 11.

7. **PLATYSTERNIDÆ.** Asiatic.

I. *Temporal muscle covered with skin, and generally protected by a narrow zygomatic arch.*

Section I. *The alveolar surface of the upper and lower jaws linear, narrow, with a sharp outer edge. Internal nostrils in front of the palate. Toes short, strong, erect, and included in the skin to the claws, or more or less expanded and united by a narrow scaly web to the claws. These species are amphibious, and some of them more or less terrestrial.* Amphibioclemmys, *Gray P. Z. S.* 1869, p. 184.

Fam. I. CISTUDINIDÆ (Box-Tortoises).

Head moderate, covered with a hard thin skin. Eyes lateral or subsuperior; iris annular, simple. Temporal muscle covered with the skin and (except in *Cistudo*) protected by a band-like zygomatic arch. Thorax covered with horny plates. Sternum very broad, attached to the thorax by a *ligamentous suture*, covered at the sides by the pectoral and abdominal shields, and divided across into two parts by a suture between the pectoral and abdominal plates. Sternal shields 12; the axillary and inguinal plates very small or wanting. The mastoid bone is excavated to form a tympanic cell. Toes strong, short, more or less webbed.

The temporal muscle of the North-American genus *Cistudo* is only covered with skin, and the skull is destitute of any zygomatic arch between the orbit and the tympanic bone. In this respect, as well as in the position of the suture between the sternum and the thorax, this genus differs from the *Lutremys* of Europe and the genera found in Asia, all of which have a well-developed zygomatic arch for the protection of the temporal muscle.

Synopsis of the Genera.

Tribe I. Cistudinina. Temporal muscle only covered with skin. Sternal lobes unequal, the front shorter, almost free from the symphysis. Skull without any zygomatic arch. America.

1. **Cistudo.**

2. **Emydoidea.**

Tribe II. Lutremyina. The temporal muscle protected by a well-defined zygomatic arch. Sternal lobes subequal, both forming part of the lateral symphysis. Old World.

a. *Toes short, scarcely exserted.*

3. **Cistoclemmys.** Thorax convex. Sternum rounded behind. Toes very short, partly enclosed.

4. **Pyxidea.** Thorax convex, solid. Sternal lobes rather narrow, notched behind. Hind toes short, slightly webbed, very unequal.

b. *Toes elongate, webbed.*

5. **Notochelys.** Thorax convex, flattened above. Lobes of the sternum narrow.

6. **Coura.** Thorax convex, three-ridged. Sternum broad.

7. **Lutremys.** Thorax depressed. Sternal lobes broad. Head ovate. Eyes superior.

Tribe III. Cyclemydina. Toes elongate, webbed. Sternal lobes moveable when young, often becoming anchylosed, notched behind.

8. **Cyclemys.**

Tribe I. CISTUDININA (North-American Box-Tortoises).

The temporal muscle only covered with skin. The skull without any zygomatic arch between the orbit and the ear-bones. Lobes of the sternum moveable at all ages, unequal; front shorter, almost free from the symphysis; the hinder fixed, narrow, elongate.

Cistudina, *Gray, P. Z. S.* 1869, p. 176.
Cistudinæ, Section I., *Gray, P. Z. S.* 1863, p. 174.

1. CISTUDO.

Thorax convex, solid; sternum rounded or truncated before and behind; the front lobe smaller, almost free from the symphysis. The fore legs with large shields in front; the toes short, enclosed, not webbed, with short conical claws. The hind feet elongate, narrow, with the second toes produced; the rest short, nearly enclosed, not webbed; the soles of the feet with subequal moderate-sized scales, the hinder edge rounded; the upper jaw has only a broad flattened hook in front which is not recurved. Iris simple. N. America.

Cistudo, *Gray, P. Z. S.* 1863; *Cat. Sh. Rept.* 39.
Agassiz, Contrib. 445.

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* *The hind feet with small hinder or outer fourth toes.*

Cistudo.

1. Cistudo carolina. B.M.

Cistudo carolina, *Gray, Syn.* 18; *Cat. Sh. Rept. B. M.* 39, 79.
C. virginea, *Agassiz, Contrib.* 445, t. 4. f. 17, 19, t. 18. f. 10.
C. clausa, *Gray, P. Z. S.* 1869, 176, f. 3.
Cistudo clausa, *Owen, Cat. Mus. R. C. S.* 192. n. 998 (skeleton), 1009 (skull of young).

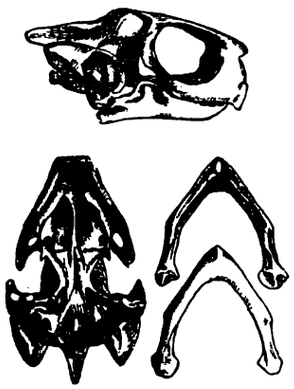
Var. 1. Cistudo ornata, *Agassiz, Contrib.* 445, t. 3. f. 1, 2.

Var. 2. C. major, *Agassiz, Contrib.* 445 (not described nor figured).

Hab. N. America.

Skeleton in the British Museum.

Fig. 7.



Cistudo carolina.

Skull in College-of-Surgeons Museum, No. 999:—Nose-hole square, moderate; orbit excessively large; tympanic cavity oblong, erect; upper jaw with a straight lateral edge and a broad central part; palate flat, internal nasal apertures anterior, with a broad triangular concavity behind them with a central ridge; alveolar plate smooth, narrow in front, rather wider behind; alveolar surface of the lower jaw rather wide, concave.

Professor Owen describes a peculiarity in the neural arch of the atlas and the other vertebræ, and the bones of the feet; but he does not notice the absence of the zygomatic arch in the skull.

** *The hind feet without any small fourth toes.*

Onychotria.

Onychotria, *Gray, P. Z. S.* 1849, p. 16; *Cat. Sh. Rept.* 46.

2. Cistudo mexicana. B.M.

Cistudo mexicana, *Gray, P. Z. S.* 1849, p. 17, t. 2; *Cat. S. R.* 40.

See also *C. triunguis*, Agassiz, Contrib. 449, which is said to be smaller than *C. carolina* and *C. mexicana*.

2. EMYDOIDEA.

Thorax rather depressed, not keeled. Sternum rounded in front, deeply emarginate behind, the hinder valve but slightly the largest. Lateral suture ——? Head moderate. Upper jaw emarginate in front; lower with a small hook. Iris simple.

Emydoidea, *Agassiz, Contrib.*

1. Emydoidea Blandingii.

Emydoidea meleagris, *Agassiz, Contrib.* t. 4. f. 10, 22.
Emys (Lutremys) Blandingii, *Agassiz, Contrib.*

Hab. North-West America, State of Illinois, in meadows and prairies (*Holbrook*). Not seen, and Agassiz forms for it a genus *Emydoidea*.

Dr. Holbrook describes and figures *Cistudo Blandingii* (t. 3) as a separate species, because it has a head like *Emys*, the upper jaw deeply emarginate in front, the front lobe of the sternum less elevated. On these characters Leconte refers it to *Lutremys*, and Agassiz to *Emys* as restricted by Bonaparte, who regards *E. europæa* as the type. The figures of Holbrook look very like *Cistudo carolina*; but Agassiz, who forms for it a subfamily, describes it as much more depressed. It is probably distinct; but I have never seen an American Box-Tortoise that could be arranged or confounded, as Leconte has done this, with our European *Lutremys*. It certainly is not *E. meleagris* of Shaw, as Agassiz believes.

Tribe II. LUTREMYINA (Old-World Cistudinidæ).

The temporal muscle protected by a well-developed band-like zygomatic arch. Sternal lobes more or less moveable, subequal; both lobes forming part of the lateral symphysis.

The zygomatic arch of the *Coura*, but somewhat imperfect, as it does not quite reach the line of the ears.

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1. *Lobes of the sternum moveable at all ages, the cartilaginous sutures and the suture between the pectoral and ventral shields of the sternum are in the same situation; and the lobes of the sternum are broad, as broad as the opening of the thorax, and cover the legs when they are contracted.*

Normal Cistudinæ, *Gray, P. Z. S.* 1863.

The normal *Cistudinæ* may be divided into genera, according to the more or less aquatic habits of the animal, as indicated by the structure of the feet.

a. *Toes short, scarcely webbed.*

3. CYSTOCLEMMYS.

Thorax convex, solid. Sternum nearly flat, rounded before and behind; the front lobe large, partly enclosed in the symphysis. The fore feet subclavate; the toes very short, nearly enclosed, not webbed; the claws short, blunt. The hind feet elephantine, subcircular; toes very short, enclosed. Soles with two series of large prominent shields; the hinder edge keeled, but scarcely produced. Tail shielded beneath. Asiatic.

Cistoclemmys, *Gray, P. Z. S.* 1863, p. 175, 1869.

This genus, in the convex and solid structure of the thorax, is like *Cistudo*; but the foot is more like that of the Land-Tortoises; and the hind foot is subcylindrical, instead of elongate as in the American genus.

1. Cystoclemmys flavomarginata. B.M.

Dark brown, shields of the back deeply concentrically grooved; the sternum flat, black; the lower side of the margin of the thorax yellow; head olive, temple yellow, with a yellow streak on each side of the crown, becoming wider and triangular behind.

Cuora (Cistoclemmys) flavomarginata, *Gray, P. Z. S.* 1863.
C. trifasciata, var., *Gray, Cat. Sh. Rept. in B.M.* p. 42 (specimen *c*).
C. flavomarginata, *Günther, Rept. Brit. India*, p. 13, t. v. fig. *a*.

Hab. China (*J. Reeve, Esq.*); Formosa (*R. Swinhoe, Esq.*).

The surface of the shell is often more or less eroded; the one which we first received from Mr. Reeve was so on the whole upper surface. The form of the foot, as well as the height and thickness of the shell, at once separates this species from *Cuora trifasciata*, with which I formerly confounded it.

Mr. Swinhoe informs me that this Tortoise is very bundant in the ponds in the district of Tamsuy, N.W. Formosa. He did not fall in with it in South Formosa, where the *Emys Bennettii* is the prevailing species. He has frequently seen the Tamsuy Tortoise showing its head and the top of its back on the surface of the water in ponds about the rice-fields, and has watched them basking, several at a time, on the tops of large stones in such ponds.

4. PYXIDEA.

The thorax convex, solid. Sternum flat; lobes rather narrow, truncated in front, notched behind. Legs with large band-like thin shields in front; toes short, scarcely exserted, with band-like shields above, slightly webbed. The hind feet rather elongate; toes slightly webbed, short; the second rather elongate, produced, with a large claw. Claws conical, acute. Iris simple.

Pyxidea, *Gray, P. Z. S.* 1863, p. 175; 1869.

1. Pyxidea Mouhotii. B.M.

The skull (as seen through the skin in the preserved specimen) is trigonal, flat on the sides; the crown flat, triangular, short, scarcely produced behind the hinder edge of the orbit; truncate behind, rather more produced in the centre; zygomatic arch flat, weak, narrowed in the centre, much narrower than the orbit in front, and gradually dilating so as to be almost half as broad as the front edge of the tympanic cavity behind; orbit rather large, lateral; beak of the upper jaw entire, with a strong central hook.

Shell oblong, pale yellow; back flattened above, with a dark-edged keel on each side; the vertebral plates continuously keeled, and rather tubercular in front; the margin strongly dentated; nuchal snield distinct.

Cyclemys Mouhotii, *Gray, Ann. & Mag. N. H.* x. 1862, p. 157.
Pyxidea Mouhotii, *Gray, P. Z. S.* 1863, p. 175; 1869.
Günther, Rept. Brit. India, 16, t. 4. fig. *d*.

Hab. Lao Mountains, Siam.

This species is most like *Cyclemys platynota*, from Singapore; but the back is much more decidedly flattened, the flattened part is strongly keeled on each side, and the edge of the shell is strongly toothed both before and behind. This is not merely an individual variety; for M. Mouhot has sent a considerable series, of different ages, and they all agree in this respect, the younger animals being more decidedly dentated on the margin and more acutely keeled on the back.

I have named this species after the late M. Mouhot, who has discovered and sent to England many new and most interesting animals of different orders.

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b. *Toes elongate, webbed.*

5. NOTOCHELYS.

Back convex, flattened above. The sternum flexuous; lobes rather narrow, truncated in front and behind. The legs and toes covered with minute scales; the front legs having a series of broad, thin, band-like shields in front. Toes webbed; they and the legs covered with very small scales; front legs only with thin band-like plates in front. Claws acute.

Notochelys, *Gray*, *P. Z. S.* 1863 & 1869.

This genus is like a true *Emys* in most of its characters; but the sternum is scarcely raised above the underside of the margin, and is united to the thorax by a cartilaginous symphysis; the lobes are separated by a straight depressed suture, but scarcely moveable. It differs from all the other *Cistudinæ* in the legs and toes being covered with minute lanceolate scales as in *Batagur*, with only a few very narrow shields near the claws.

1. Notochelys platynota. B.M.

Emys platynota, *Gray*, *P. Z. S.* 1834, p. 54; *Illust. Indian Zool.* t.
Notochelys platynota, *Gray*, *P. Z. S.* 1863.
Günther, *Rept. Brit. Ind.* p. 17.
Cyclemys platynota, *Gray*, *Cat. Sh. Rept. B.M.* p. 43.

Hab. Sumatra; Singapore (*Wallace*).

The head with a pale streak on each side, extended down the upper part of the sides of the neck.

The young specimens have one small black spot on the back edge of the areola of the costal, and two on the back edge of the areola of the vertebral plates.

6. CUORA.

The thorax rather convex, more or less three-ridged. The sternum flat; lobes subequal, both enclosed in the symphysis. Head flat at top; eyes lateral, iris simple. The front of the fore legs with large scales. The toes all banded above, webbed. The claws conical. The hind feet depressed; the hinder edge fringed and angularly produced. Skull: zygomatic arch distinct, strong, rather convex. Asiatic.

Cuora, *Gray*, *Cat. Sh. Rept.* 41; *P. Z. S.* 1855, p. 198, & 1863, p. 176.

* *The head large, flat, with two yellow streaks on each side; back one-coloured; toes broadly webbed.* Cuora.

Cuora, *Gray*, *l. c.*

1. Cuora amboinensis. B.M.

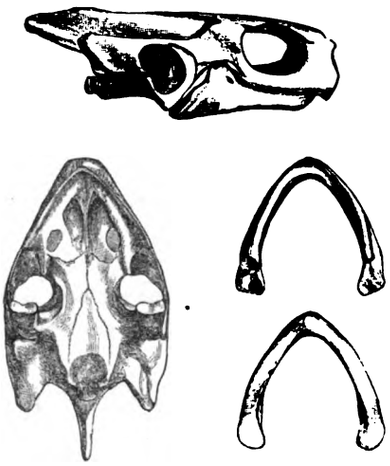
Cuora amboinensis, *Gray*, *Cat. Sh. Rept. B.M.* 41; *P. Z. S.* 1861, p. 140.
Theobald, *Journ. Linn. Soc.* x. 11, 1868.
Günther, *Rept. Brit. Ind.* 12, t. 4. fig. *a* & *b*.

Hab. Amboyna; Gilolo (*Wallace*); Borneo (*Wallace*).

A black streak on the side of the head over the ears, including two oblong pale spots, one behind and rather above the other.

There are, in the collection of Dr. Bleeker:—a small half-grown specimen of this species under the name of *Cistudo amboinensis*; a very dark young specimen of about the same size as the former, called *Emys melanogaster*, Bleeker;

Fig. 8.



Cuora amboinensis.

and a large adult specimen named *Emys hypselonotus*, Bleeker. These all three seem to belong to *Cuora amboinensis*, Gray, Cat. Sh. Rept. B.M. 41; Proc. Zool. Soc. 1863, p. 176.

Dr. Bleeker states that this species is found in Batchian and Boero (Nat. Tijdschr. Nederl. Ind. 1857, p. 473).

Dr. Bleeker, in the paper above cited, has called a species *Cistudo borneensis*, from Borneo and Sintang; but I have not seen any specimen so named.—*Gray*, *P. Z. S.* 1864.

Skeleton in the British Museum.

Skull rather elongate, rhombic, ovate; crown flat; nose erect; nose-cavity square, moderate; orbit large, oblong,

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transverse, lateral; zygomatic arch complete, broad in front, narrowed behind and attached to the upper front part of the tympanic cavity; mastoid bone acute behind, keeled on the outer upperside, hollow; palate flat; internal nostrils anterior, with a short, oblong, slightly sunken concavity behind, each separated from the other by a blunt ridge; alveolar plate very narrow, linear, with a slight ridge on the inner margin; upper beak with a smooth edge and an entire, recurved, sharp tip. Lower jaw moderately strong, rounded below in front; lower beak with a simple sharp edge, rather produced and acute in front, with a slightly concave linear inner margin.

Skeleton in the British Museum.

Skull solid, crown flat; nose straight, high in front; orbits large, lateral; zygomatic arch moderate, strong on the lower extremity; internal nostrils anterior, large, with a slight concavity behind each; mastoid bone produced, acute above behind; upper beak keeled in front, with a central prominence; sides even; alveolar margin narrow, linear; lower jaw rather produced and acute in front.

A young specimen in spirit, received from Dr. Bleeker, named *Emys melanogaster*.

Black-brown, lighter beneath; nose rather produced, shelving to mouth below. Head: crown olive; alveolar surface linear, with a narrow pale streak on each side of the crown edging the eyebrows; sides of head and throat pale olive; crown flat, streak from back of eye; a short black streak from lower part of orbit towards tympanum; a longer black streak from the angle of the mouth to underside of tympanum; tympanum covered with skin, very obscurely seen. Toes short, diverging, narrowly webbed.

See Cistudo amboinensis, *Gray*.
Giebel, Zeitschrift fur ges. Natur. 1868, p. 11.

Hab. Island of Banka.

** *Head smaller, oblong, with a broad dark streak on each side; back three-banded; toes narrowly webbed.*
Pyxiclemmys.

Pyxiclemmys, *Gray, P. Z. S.* 1863, p. 176.

2. Cuora trifasciata. B.M.

Cuora trifasciata, *Gray, Cat. Sh. Rept.* 42.
Günther, Rept. Brit. India, 14.
Cistudo trifasciata, *Gray, Syn. Rept.* 19; *Illust. Indian Zool.* t. .
Sternothærus trifasciatus, *Bell, Zool. Journ.* vi. 299, t. 13.

Hab. China.

7. LUTREMYS.

Lutremys, *Gray, P. Z. S.* 1855, p. 194, 1863, & 1869.

Thorax depressed. Sternum flat; lobes subequal, both enclosed in the symphysis. Head ovate; eyes superior. The legs with large scales in front. The feet depressed; toes webbed, banded above; the hind feet fringed and angularly produced behind. Claws elongate, acute. Skull: zygomatic arch well developed, broad.

1. Lutremys europæa. B.M.

Lutremys europæa, *Gray, Cat. Sh. Rept.* 40.

Hab. Europe.

Very variable in colour.

The anatomy of the animal is well described by Bojanus. The skull is figured by Cuvier (Oss. Foss. v. t. 11. f. 13–16) and Wagler (in N. Syst. Amph. t. 5. f. xv.–xviii.). There is a skeleton in the British Museum; it has a well-developed zygomatic arch.

c. *Toes elongate, webbed; lobes of the sternum moveable in the young state, often becoming anchylosed.*

8. CYCLEMYS.

Cyclemys, *Gray, P. Z. S.* 1855, p. 198, 1863, p. 177, and 1869.

The thorax convex or depressed. The sternum flat or slightly convex, with the lateral symphyses well marked, truncated before and notched behind; the cross suture indistinctly marked and narrow, more or less obliterated in the adult, covered with the produced front edge of the ventral shields. The legs covered with large, band-like thin plates in front. The toes banded above, the front one short, webbed. The hind feet flattened, with the toes broadly webbed; the hinder edge keeled and angularly produced. Skull: zygomatic arch distinct, moderate.

In these *aberrant Cistudinæ* the lobes are only moveable in the young state; the transverse suture that divides the bones of the sternum into two parts is straight and transverse, while the front edge of the pair of ventral shields overlaps its edge and forms a sinuous line in front of the suture. The lobes of the sternum are narrower than the opening of the thorax, as in *Emys*, and do not cover the legs when they are contracted.

This genus forms the transition to the Tortoises with

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solid and fixed sternum; but it is easily known from them by the sternum being scarcely raised above the margin of the thorax, and by the existence of the cartilaginous sutures between the sternum and thorax.

Mr. Theobald, against the experience of most zoologists and the specimens in museums, states that the suture of the lobes of the sternum of this genus "becomes more developed in aged specimens" (Journ. Linn. Soc. x. 1868, p. 12); but it was of no use demonstrating the fact to him; his mind was made up, and, as he said, he feared to talk with me and other zoologists because he thought we should try to convince him that he was wrong!

"Eggs elongate-oval or, rather, cylindrical, very large for the animal, and four in number. Flesh excellent."—*Theobald.*

* *Thorax depressed, suborbicular.*

1. Cyclemys dhor. B.M.

Cyclemys orbiculata, *Bell, P. Z. S.* 1834, p. 17.
Theobald, Journ. Linn. Soc. x. 1868, pp. 8, 12.
Cyclemys dentata (adult), *Gray, Cat. Sh. Rept.* 42, t. 19; *P. Z. S.* 1863; 1869.

Shields brown-rayed.

Hab. Java.

Skull elongate; zygomatic arch rather narrow, distinct. The alveolar surface of the upper jaw is narrow, with a well-marked longitudinal groove the whole length of the outer edge, and with a raised internal margin; edge of the upper jaw rather arched on the side, with a small central tooth; the lower jaw with a simple, short edge shelving inwards in the centre, and with a rather concave surface on the inner side, and a sharp, produced central anterior process.

Mr. Bell, in his 'Testudinata,' gives two figures of the underside of the shell of his *Cyclemys orbiculata*; and in his text says that he cannot assent to M. Bibron's referring this species to the genus *Cistudo*. These undersides evidently represent two distinct species; and the upper figure of the two shows the very cross suture that Mr. Bell denies to exist.

The lower figure represents the sternum of *Cyclemys orbiculata*, with the lobes, especially the hinder ones, narrower than the openings in the thorax.

The upper figure represents a species where the lobes are broad and rounded, and nearly as broad as the aperture in the thorax.

It indicates the existence of a species which has not occurred to me, and to which the name of *C. Bellii* may be applied. Perhaps it is one of the specimens which he received from either Madras or Bombay; for he says he has received them from those countries as well as from China; and I have not seen any specimens of the genus from either of these two localities.

All the three specimens of this species in the British Museum have the lobes of the sternum narrow, like the lower figure. The figure of the shell, with the animal, in Mr. Bell's work better represents *Cyclemys Oldhamii* than the depressed, flattened *C. orbiculata* of Java.

The small figure of *Emys dentata* of my 'Illustrations of Indian Zoology' represents, I think, probably the young of *Geoemyda grandis*, Gray (Ann. & Mag. N. H. 1860), judging by the series of specimens brought by M. Mouhot from Camboja. The larger figures are those of a young *Batagur*.

Skeleton in the British Museum, from Java.

** *Thorax oblong, convex.*

2. Cyclemys Oldhamii. B.M.

Cyclemys Oldhamii, *Gray, P. Z. S.* 1863.
Günther, Rept. Brit. India, 15, t. 5. f. *b*.
Cistudo dentata (adult), *Gray, P. Z. S.* 1857, p. 183.
Bell, Testudinata, t. (with animal)?

Thorax oblong, convex; back flattened, bluntly keeled, and with a convexity in front, and two acute prominences at the end of the last two vertebral shields; costal plates rather convex, with the areola on the upper hinder margin; shields concentrically striated, brown, with some black lines on the part of the costal shield near the lateral keels; margin toothed behind; thorax flat; shields pale, with dark rays.

Hab. Mergui (*Professor Oldham*); Siam (*M. Mouhot*).

I was formerly inclined to believe this was an adult of the former species; but we have lately received a second specimen, which proves that it is perfectly distinct.

3. Cyclemys ovata. B.M.

Cyclemys ovata, *Gray, P. Z. S.* 1863, 1864.

Thorax ovate, grey-brown, convex, hinder edge acutely dentated; the middle of the back rather flattened, bluntly keeled in front and above, and acutely keeled on the shelving hinder parts; the sides shelving, the front slightly and the hinder part rather deeply impressed; the upper part of the costal plates convex; the sternum pale grey-brown.

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Hab. Sarawak (*Wallace*, no. 138).

The specimen is not in a good state; probably the animal had been in confinement and was out of health; the cross suture on the sternum is much eroded on the edge, and the shell seems to be discoloured.

There is a second specimen, which was presented to the British Museum by Sir Andrew Smith, C.B., without any habitat, which is perhaps a younger stage of the species; but it does not show any mark of the transverse suture on the sternum, and the marginal plates are all broad and equally so, while, in the specimen from Borneo, the fourth, fifth, and sixth lateral marginal plates are much broader than the others on each side, and ascend up into the margin of the costal ones; and the sides of the shell are rather more convex in front, and only slightly and not so deeply impressed behind.

The shell is uniform pale brown above, and brown below,

Fig. 9.

with regular close radiating paler rays, which are wider and more distinct near the margin of the shield. The areola on the vertebral shield is close to the hinder margin, near the upper hinder angle of the costal shields, and it is near but not on the hinder outer edge of the sternal shields.

The dried animal is brown; the front edge of the fore legs are covered with irregular-sized scales.

There is a young specimen of a fluviatile Tortoise named *Cistudo Diardii*, Bleeker; but it is in too young and imperfect a state to decide which of the three species of the genus *Cyclemys* it may belong to. The back is rather more oblong than in the very young specimens I have seen of *Cyclemys orbiculata*; so that it may belong to either *Cyclemys ovata* of Sarawak or *Cyclemys Oldhamii* of Siam—most probably the former; but I have never seen the young state of these species.

See "Cistudo orbiculata, *Bell.*"
Giebel, Zeitschrift für. ges. Natur. 1868, p. 13.

Hab. Isle of Banka.

See Cyclemys dentata, *Giebel, Zeitschrift für ges. Natur.* 1868, p. 15, t. 3.
Emys dentata, *Gray*?

Hab. Isle of Banka.

Probably a new species, or a *Cyclemys*.

Fam. II. EMYDIDÆ (True Terrapins).

The head covered with thin hard skin, and a distinct zygomatic arch rarely wanting; the temporal muscle protected by a soft skin; eyes lateral or superior. The alveolar surface of the upper and lower jaw smooth, narrow, linear, close to the margins of the beaks, with a sharp outer edge. Internal nostrils in front of the palate. Sternum attached to the thorax by a bony symphysis, solid, and covered with 12 shields. Toes short, strong, erect, and included in the skin to the claws, or more or less expanded and united by a narrow scaly web to the claws. Amphibious, and some of them more or less terrestrial.

Emydidæ, Section I. Amphibioclemmys, *Gray*, *P. Z. S.* 1869, p. 184.

When my two papers on the skulls of *Chelydradæ* and *Trionychidæ* were published, I hoped that some of the American zoologists, who have so many species of one group (Emydidæ) living in their country, and consequently at their command, would take up the subject. But they have not done so; and as the British Museum has received a few more specimens, I have determined to do the best I can with the specimens at my command, and the figures of the specimens that have been published by Wagler and others.

It is to be regretted that Agassiz, in his notes on the American Terrapins in his 'Contributions,' has confined his attention so completely to the external characters, and the development of the young animal. He does make some observations on the form of the jaws; but they are so indistinct and general that they afford very little information.

I was in hopes of obtaining a number of specimens from the Smithsonian Institution for the purpose of determining the form of the chewing-surface of the jaws of the North-American species; but they are so short-handed as regards scientific assistance that they have not been able to send them

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up to this period. Unfortunately I should not have been able to regard them as typical specimens of the species, for Prof. Agassiz sent the specimens which he had for examination when he was at work upon his book back to the Institution without names; but yet they would have been interesting as being all specimens collected in the United States, and therefore the species described by Say, Holbrook, Leconte, Prof. Agassiz, and other American authors.

The skulls of all the genera which I have examined have a distinct zygomatic arch protecting the temporal muscles, excepting *Geoemyda*. It is generally well-developed, sometimes very strong; but in *Melanochelys* it is weak, tapers off behind, and sometimes does not reach the edge of the tympanic cavity.

Synopsis of the Genera.

Tribe I. Geoemydina. Head covered with a thin hard skin; front of the fore legs covered with thick, hard, unequal shields. Toes very short, united to the claws.—Terrestrial.

* *Zygomatic arch none.*

1. **Geoemyda.**

** *Zygomatic arch distinct.*

† *Eyes very large, subsuperior.*

2. **Nicoria.** Shell three-keeled; keels far apart, continued.

†† *Eyes lateral.*

3. **Geoclemmys.** Alveolar surface narrow, linear.
4. **Glyptemys.** Alveolar surface of lower jaw rather broad.
5. **Rhinoclemmys.** Iris with a black spot on each side of the pupil.

Tribe II. Emydina. Head covered with a thin hard skin. The zygomatic arch distinct. The front of the fore legs covered with thin scales and cross bands. Toes strong, spreading, webbed. Eyes superior.

* *Zygomatic arch imperfect, weak.*

6. **Melanochelys.**

** *Zygomatic arch complete.*

7. **Mauremys.**
8. **Ocadia.**
9. **Sacalia.**
10. **Redamia.**
11. **Emys.**
12. **Emmenia.**
13. **Chrysemys.**
14. **Deirochelys.**

Tribe III. Belliana. Like *Emydina*; but skin of neck and limbs covered with very minute scales.

15. **Bellia.**

Tribe I. GEOEMYDINA.

Head covered with a thin hard skin. Front of fore legs covered with thick hard scales. Toes short, expanded, strong, united to the claws or slightly webbed. Eyes generally lateral; pupil round, generally without any lateral spots. Skull: zygomatic arch generally distinct; alveolar surface smooth, narrow.

* *Zygomatic arch none.*

Geoemydina, *Gray, P. Z. S.* 1869, p. 184.

1. GEOEMYDA.

Toes rather short, free, or united by a short web at the base, spreading. Zygomatic arch none.

Geoemyda, *Gray, P. Z. S.* 1860; *Ann. & Mag. N. H.* 1860; *Cat. Sh. Rept.* p. 16; *P. Z. S.* 1869, pp. 184, 186; *Günther, Rept. Brit. Ind.* p. 18.

The skull of *Geoemyda grandis* (as seen through the skin) in a very large old and a younger stuffed specimen, like the skull of a *Cistudo*, is destitute of any zygomatic arch uniting the orbit to the ear-cavity of the temporal bone, the temple and temporal muscles behind the orbit being only covered with a skin protected by thin, small, tessellated plates.

A second half-grown specimen agrees with the very large old specimen above noticed in the absence of the zygoma.

The alveolar surface of the jaws has not been examined.

1. Geoemyda spinosa. B.M.

Geoemyda spinosa, *Gray, Cat. Sh. Rept.* p. 16; *P. Z. S.* 1861, p. 139.
Theobald, Journ. Linn. Soc. xii.
Günther, Rept. Brit. Ind. 18.
Testudo emydoides, *Duméril, Arch. du Mus.* vi. 216.

Hab. Penang and Sumatra; Cambogia and Pegu. "Lays eggs in a hole four at a time."

2. Geoemyda grandis. B.M.

Shell oblong-elongate, dusky brown; back keeled; vertebral plates elongate; the first urn-shaped, bluntly

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keeled, the fourth and fifth sharply keeled; hinder edges strongly serrated; nuchal plate distinct; sternum truncated in front, deeply notched behind (of male very deeply concave); head large; claws very sharp and strong. Length of shell 16 inches, width 11 inches.

Geoemyda grandis, *Gray, Ann. & Mag. N. H.* 1860, p. 218.
Günther, Rept. Brit. Ind. 19, pl. iii. fig. *a* & *b*.
Cistudo bankanensis, *Bleeker*?

Dark brown; marginal plate with a white marginal keel; sternum white, with a large black areola or nucleus to each plate; head black, with a white streak edging the upper part of the nose, and continued and broader on the upper edge of the temple; an arched white band in front of the eye to the angle of the mouth; two small streaks and a white spot under the nose; chin with a lunate band continued on the edge of the lower jaw, and with a branch towards the angle of the mouth; throat black, with two large white spots behind.

Hab. Cambogia (*M. Mouhot, Aug.* 1860).

Under the name of *Cistudo bankanensis*, Bleeker, evidently from Banka Island, we have received a young specimen of a terrestrial Emydide, with moderately stout, rather short toes united by a distinct web nearly to the tips. The toes are covered above with small scales like those on the webs; and there are only two or three very small, triangular, rather broader and more band-like scales on the upper surface of each of the toes near the claws, which are most developed and numerous on the inner toes or thumbs of each foot. The fore legs are covered in front with very thin membranous band-like shields; the hind legs are covered with small scales.

This specimen agrees in almost every particular with a young specimen of *Geoemyda grandis*, which I described in the 'Annals and Magazine of Natural History' for September 1860 (vol. vi. p. 218), from Camboja and Siam; so that I am inclined to think that it may be a variety of that species.

It differs in the underside being plain yellow, and very obscurely mottled with some smaller rather dusky spots.

There are also on the side of the head two yellow streaks —one from the upper, and the other from the lower hind angle of the eye—which are extended on to the temple. These are not visible in our dried specimen of the Tortoise from Siam, but they may be there in the living state.

3. Geoemyda tricarinata.

Shell 5½ by 3½ inches, subovate, broader posteriorly, of a dark reddish-brown colour above, with three yellow longitudinal ridges, which are flat and obtuse, below pale dull yellow; claws long, stout, and considerably hooked; soles expanded, indicative of terrene habits; dorsal shields hexagonal, the third and fourth broader than long; the fifth approximating a triangular form, with posterior base; nuclei of costal shields placed high and traversed by the low lateral ridge.

Geoemyda tricarinata, *Blyth, J. A. S. B.* xxiv. 714 (description), xl. 73.
Günther, Rept. Brit. Ind. p. 18.

Hab. ——?

** *Zygomatic arch distinct.*

Geoclemmydina, *Gray, P. Z. S.* 1869, p. 188.
Clemmydoida, *Agassiz, Contrib.* 442.

† *Eyes subsuperior, on the margin of the crown.*

2. NICORIA.

Nicoria, *Gray, Cat. Sh. Rept.* p. 17; *P. Z. S.* 1869, p. 189.

The skull of *Nicoria Spengleri* (as seen through the skin in the stuffed specimen) narrow, rather acute in front, flat on the sides. Orbit very large, subsuperior. Zygomatic arch broad, flat, as wide as the back edge of the orbit, as wide behind as the rather small tympanic cavity. Lower jaw rather weak, with a large inferior space, rather rounded in front. The sheath of the upper jaw is strongly and acutely hooked at the tip, and entire on the edge. Palate ——? The toes enclosed in the skin to the claws, covered with band-like shields. Eyes very large, subsuperior.

1. Nicoria Spengleri. B.M.

Nicoria Spengleri, *Gray, Cat. Sh. Rept.* 17; *P. Z. S.* 1869, p. 189.

Hab. China.

†† *Eyes lateral.*

3. GEOCLEMMYS.

Geoclemmys, *Gray, Cat. Sh. Rept.* p. 17; *P. Z. S.* 1869, p. 188.

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Skull of *G. guttata* thin, crown slightly arched, nose erect. Orbit lateral, very large. Zygomatic arch broad, short; palate flat behind. Lower jaw slender. Side edges of the upper jaw slightly arched, and with a notch in front; alveolar groove very narrow, even. Mastoid bone conical, produced, hollow. Iris annular. Toes short, strong, united together to the tips; claws only free.

All the American species figured by Holbrook have a uniformly coloured iris, without any spots on the sides of the pupil.

Professor Agassiz has divided the four North-American species of this genus, which he has formed into a subfamily (Clemmydoidæ) into four genera, viz. :—

1. Nanemys=E. guttata.
2. Calemys=E. Mühlenbergii.
3. Glyptemys=E. insculpta.
4. Actinemys=E. marmorata.

But he admits that he is doubtful if two or more of them ought not to be united (p. 443).

The genera are merely indicated, and cannot be regarded as characterized.

1. Geoclemmys guttata. B.M.

Geoclemmys guttata, *Gray, Cat. Sh. Rept.* p. 19; *P. Z. S.* 1869, p. 188.
Nanemys guttata, *Agassiz, N. H. U. S.* i. 442, ii. t. 1. f. 7, 8, 9 (junior).

When first hatched, only a single spot on the centre of each shield and none on the marginal ones. Old specimens, someare all black.

Hab. North America. Lives in ponds, brooks, and rivers, and takes to the land to search for earthworms and grasshoppers.

A beautiful skeleton is in the British Museum, and a skeleton without lower jaw in the Museum of the College of Surgeons, no. 977 *a*.

"Eyes large; iris reddish grey, surrounded by a circle of brighter red."—*Holbrook*, 82.

2. Geoclemmys marmorata. B.M.

Emys marmorata, *Baird & Girard, Proc. Acad. N. S. Philad.* 1852, p. 177.
E. nigra, *Hallowell, Proc. Acad. N. S. Phil.* 1854, vii. 96. *Gray, Cat. Shield Rept.* 77.
Actinemys marmorata, *Agassiz, N. H. U. S.* i. 444, ii. t. 3. f. 5, 6, 7, 8 (junior).

Hab. Vancouver's Island (*Lord*); Western slopes of N. America from Paget Sound to Montery, California (*Agassiz*).

"Areola large, granular. Shield radiately grooved; when old, smooth. Varied from green to black, mottled with light radiating spots; below light yellowish, sometimes with a black areola on the shields. Tail of male long and tapering; of female short and blunt."—*Agassiz*.

3. Geoclemmys Mühlenburgii. B.M.

Geoclemmys Mühlenburgii, *Gray, Cat. Sh. Rept.* 19; *P. Z. S.* 1869, p. 188.
Calemys Mühlenburgii, *Agassiz, N. H. U. S.* i. 43.

Hab. New Jersey to the eastern parts of Pennsylvania. "Scales smooth or concentrically grooved, with or without keels on the back."—*Agassiz, l. c.*

Hab. N. America. "Lives in small brooks or streams of running water."—*Holbrook*, 48.

"Eyes large. Iris brown, with an orange outer circle; pupil dark."—*Holbrook*, 46.

An adult specimen in spirit, from North America, with the yellow spots on the occiput well-marked. The beaks have an even lateral edge and an acute notch in the centre in front; the lower beak convex and rounded below; crown rather convex, dark olive, with black spots. Toes united in the skin to the claws, with a few band-shaped shields above. The upper alveolar surfaces rather broadly linear, with a submarginal internal ridge; the lower with a continuous submarginal groove, rather broad, and produced, with a sharp edge, in front.

4. Geoclemmys callocephala. B.M.

Shell oblong, convex, bluntly keeled; dark blackish brown; shields thin, slightly ringed, the margin nearly entire; vertebral shields about as long as broad, the second and third rather longer; nuchal shield short; the marginal shields broad, the ninth rather higher than the rest; underside of these yellow, not spotted or ringed; the sternum convex, rather bent up in front, broadly truncated before and behind, pale yellow, more or less blackish on each side of the central line. The upper part and sides of the neck pale; the upper part of the legs closely speckled with minute black dots; the front of the fore legs pale, with some black spots on the edge of the large flat scales which

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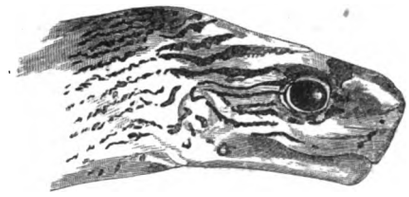
cover this part; the front toes short, coalesced nearly to the claws, with a few rather narrow angular shields on the upper surface; the palms covered with moderate scales, and with a cross row of five large, nearly uniform-sized, squarish shields on the hinder part of the wrist; the hind legs covered with small scales; the hind foot broad, the toes short, and coalesced like the front one, but with rather larger shields above the soles, with moderate-sized scales, and with some large triangular shields at the hinder part of the heel, in two or three series; the chin and throat white, spotless; the head rather flattened; the eyes lateral;

Fig. 10.



upper jaw slightly notched in front; the crown of the head (in spirits) pale, with three black-edged white broad streaks concentric one within the other, and diverging parallelly towards the occiput, where they are lost among the black specks; cheek with five or six black horizontal lines, the lower bending up to the tip of the ears; there is an obscure black streak from the nose to the middle of the orbit, and a narrow streak near the upper edge of the upper jaw, and some black oblong spots on the lower side of the ear and temple, which may be more distinct in the living specimen. The upper beak with an acute central notch; the alveolar surface linear, with a submarginal ridge on the upper, and a narrow groove in the lower jaw.

Geoclemmys callocephalus, *Gray*, *P. Z. S.* 1863, p. 254; 1869, p. 189.

Hab. Unknown; perhaps China.

This species in several respects agrees in form and appearance with *Emys chinensis*, of which, as is shown by the specimen brought by Mr. Swinhoe to this country, the Tortoise described by me as *Emys Bennetti* is only the adult. It is at once known from *E. chinensis* by the minutely speckled body and the bands on the head, and by the under surface of the marginal shield being destitute of any rings or spots. The head and neck of *E. chinensis* are covered with uniform narrow black lines, which on the chin and throat form circles. *E. chinensis*, like *E. Bealei*, is a true *Emys*, with slender, distinctly developed toes and fingers, which are united by a web to the claw,—*E. chinensis* having moderate-sized thick scales in front of the fore legs, with some larger and broader scales, or small shields, scattered among them, and *E. Bealei* small granular scales on the legs, with three or four broad, thin, lunate, band-like shields across the front of the fore legs.

In the black specks on the neck and body, and the ornamental lines on the head, this species has some affinity to *E. pulcherrima*, described and figured in my Catalogue from a very young specimen, said to have come from Mexico. But this habitat is doubtful, as some other animals, procured from the same person and said to be from the same habitat, have proved to be from other countries. This species also, as far as can be judged from the dry state of the specimen, may probably be a *Geoclemmys*.

5. Geoclemmys rubida.

"Carapace oval, moderately elevated, and with obtuse median keel, margin entire, not recurved; vertebral plates broader than long, with concave posterior sutures, except the anterior, in which the length is somewhat in excess; the lateral margins are parallel, and the anterior angle is produced, curtailing the small nuchal; scuta concentrically grooved, visible although obsolete in the old individual; plastron rather plain, nearly emarginate behind, very openly in front; inguinal and axillary scales very small. Areola of the scuta a little above and behind their centres; alveolar surface without grooves or ridges."

Chelopus rubidus, *Cope*, *Proc. Am. Phil. Soc.* 1869, p. 148.

Hab. Mexico.

"Allied to *C. callocephalus*, Gray."

4. GLYPTEMYS.

The upper or alveolar surface of the under jaw wide, angular, concave in front, narrow and sharp-edged on the sides behind. Internal nostrils subanterior.

Glyptemys, *Agassiz*, *Contrib.* 443.
Gray, *P. Z. S.* 1869, p. 196.

1. Glyptemys pulchella.

Geoclemys pulchella, *Gray*, *Cat. Shield Rept.* 18.
Glyptemys insculpta, *Agassiz*, *Contrib.* 443.
Gl. pulchella, *Gray*, *P. Z. S.* 1869, p. 196.

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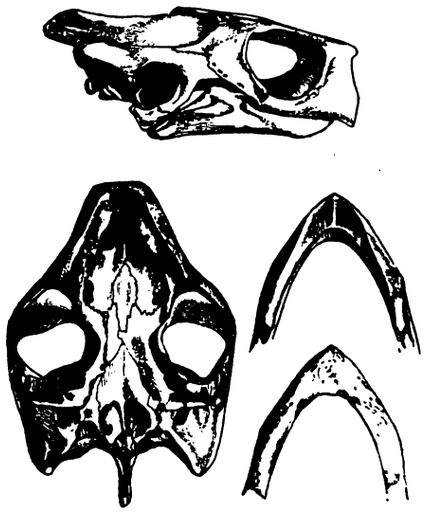
The skeleton of a large specimen which had been in confinement, with the bones separate, in the British Museum, prepared by Dr. Günther. The skull with a broad, very flat forehead, and high, square nose; the latter granular, the lower half sunk in a deep wide notch in the upper edge of the upper beak; upper beak high, with an acute central notch; lower jaw strong, thick and convex in front; zygomatic arch strong, convex; orbit large, quite lateral, with a narrow lower hinder edge; palate concave in front, flat behind; internal nostrils large, anterior; the alveolar surface of the upper jaw rather broad, smooth, with a slight concavity in front; the lower jaw broad in front, narrower on the sides, regularly concave.

Fig. 11.



Glyptemys pulchella.

The broad front of the alveolar surface of the lower jaw separates these animals from the genus *Geoclemmys*; and therefore I have adopted Agassiz's generic name.

The skull is described in Gray's Cat. Shield Rept. 19.

Hab. Atlantic States, from Maine to Pennsylvania; living in ponds and rivers and remaining on dry places for months uninjured. Restless and very active, both on land and in the water.

"Eyes large. Iris dark brown, surrounded by a yellow circle."—*Holbrook*, 94.

A large specimen in spirit in the British Museum. Skull rather thin, ovate-rhombic, sides flat; orbit very large, subsuperior, in the upper margin of the crown; crown rhomboid, produced into an acute point behind, the hinder end as far from the hinder edge of the orbit as that part is from the end of the nose; zygomatic arch short, broad, rather broader in front than the back edge of the orbit, about as large as the small circular tympanic cavity behind, but attached to the temple rather below the upper margin of the tympanic cavity. The upper jaw (with the sheath on) has a sharp edge with a broad internal groove edged on the inner side by a slight ridge. Palate rather concave, especially in front. The sheath of the upper jaw with a slightly bidentate notch in front, and simple straight sides. The lower jaw strong, erect on the sides, shelving, convex, and rounded in front, covered with a horny sheath, and with a central acute point.

5. RHINOCLEMMYS.

Head flat at the top; cheeks erect; nose rather produced above; upper beak high, slightly arched on the side edge; lower jaw slender; beak acute and bent up in the middle; zygomatic arch short. Front legs covered with rather large, broad, six-sided plates. Toes 5.4, webbed to the claws; claws acute. Orbits lateral; pupil with a black spot on each side so as to make a horizontal band across the eyes. Alveolar surface with a small circular pit in front and a narrow groove on each side, linear, with a raised inner edge; of lower jaw with an acute edge. Internal nostrils anterior, with a concavity behind them.

Peculiar from being of a dark, nearly uniform colour, with a pale ring round the circumference of the dark sternum. In some species the keel of the shell is of the same colour as the back; and the head is dark, with a streak on each side of the nose and temple. The toes are very short, with a short web.

Tropical America.

Rhinoclemmys, *Fitzinger, Gray.*
Emys †††, *Gray, Ann. & Mag. N. H.* 1863, xii. 182; *Cat. Sh. Rept.* 31 (1855).

† *The sternum flat longitudinally, and very slightly elevated at the sides under the sterno-costal symphyses.*

1. Rhinoclemmys annulata. B.M.

Rhinoclemmys annulata, *Gray, Ann. & Mag. N. H.* 1863, xii. 182; *P. Z. S.* 1869, p. 189.
Geoclemmys annulata, *Gray, P. Z. S.* 1860, 231, t.; *Ann. & Mag. N. H.* 1860, vi. 148.

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Shell oblong, subquadrangular, black, slightly and irregularly varied with yellow; the vertebral plates square, almost as long as broad, with a compressed flat-topped anterior keel, highest on the fourth vertebral plate, which is narrower behind; margin subentire, with a triangular yellow spot on the underside of each plate; nuchal plate distinct; sternum flat, rounded on the sides, black, with a broad yellow band, forming a ring round the margin.

Hab. West coast of America. Esmeraldas, in Ecuador (*Fraser*); Gulf of Darien (*Salvin*).

The adult shell has much the external appearance of a land Tortoise of the genus *Testudo*, but it has the divided caudal plate of the *Emydæ*. The nuclei of the vertebral plates are posterior and submarginal; those of the costal plates are placed in the upper hinder angle; the horny shields of these plates are concentrically grooved. The sternum is flat, rather suddenly bent up and truncated in front, and slightly curved and with a deep triangular notch behind; the broad yellow ring on this part gives it a very distinct appearance.

The young specimen, with the animal preserved in spirits, is black like the adult; but the back is much lower and rather concave in the middle, with a very strong yellow, rounded keel. The hinder margin is slightly, and the front lateral margin is strongly, turned up at the edge, The head is rather small and black, the crown, the temple, and the neck being varied with broad white streaks or spots. The limbs are black, with a few broad white streaks and some white spots. The front of the fore legs is covered with cross rows of large scales, the soles of the feet with larger scales; the rest of the legs is covered with small granular scales, the hinder edge of the fore feet with three or four acute shields; the outer edge of the hind feet, marking the rudimentary outer hind toe, is edged with larger shields. Toes 5 . 4, short, thick, conical, only very slightly webbed at the base, and covered above and on the sides with three series of rather large shields. Tail short, conical, with rings of small black scales.

Head dark; crown with a white streak, more or less interrupted, on each margin, white-varied in centre; temple with a white streak forked in front; side of head white-streaked; upper jaw entire; lower narrow, convex. Front feet very short, united, scaly; toes very short, slightly webbed at the base; claws sharp; two larger scales or shields near the claws; front of fore legs with large unequal scales; hind feet rather elongate, narrow; toes very short, slightly webbed at the base; the second largest, third rather shorter, first and fourth equal, very short.

2. Rhinoclemmys mexicana.

Thorax oblong, slightly and bluntly keeled only in front over the vertebral plates, dark brown, slightly mottled; dorsal and marginal shields thin; the first vertebral shield nearly square, four-sided, the second and third oblong, transverse, six-sided; sternum slightly raised on the sides, truncated in front, and notched behind; dark brown, with an irregular yellow margin; head brown; throat and sides of the head yellow, black-spotted; crown dark brown, with a narrow white streak over the nostrils towards the orbits, with a broad white lunate band behind, with its front edge just even with the eyes, and with an indistinct broad pale streak on each side of the occiput.

Rhinoclemmys mexicana, *Gray*, *P. Z. S.* 1870.

Hab. Mexico; San Juan del Rio de Rebouch (*M. Sallé*).

†† *The sternum slightly arched longitudinally, and much elevated at the sides under the sterno-costal symphyses.*

3. Rhinoclemmys scabra.

With a spot on each side of the nose, and a band on each side of the crown, from the forehead, across the orbit, to the edge of the temple, and a spot on each side of the occiput. The underside of the margin of the young shell variegated. Throat black, streaked on the sides.

Emys scabra, *Gray*, *Cat. Shield Rep.* 31.
E. scabra, No. 2, *Gray*, *Cat. Shield Rep.* 78.
Testudo punctularia, *Daudin*?
Chelopus punctularius, *Cope*, *Proc. Acad. N. S. Ph.* 1865, p. 185.
Rhinoclemmys scabra, *Gray*, *Ann. & Mag. N. H.* 1863, xii. 182; *P. Z. S.* 1869, p. 189.

Hab. East coast of tropical America. Guiana; Brit. Mus.

I first described this species in the young state; but they all have the band on the side of the face interrupted by the orbit. Crown black, with a spot before each eye, and an oblong band on the crown, over back part of orbits.

Skeleton in the British Museum received from the Utrecht Museum. Skull elongate, rather solid; nose erect, shelving beneath; crown rather convex; orbits large, circular, lateral; sides of the face nearly erect; zygomatic arch very broad, forming part of the temple above, slightly convex on sides; mastoid bone rather elongate; edge of upper beak straight, with a slight central notch. Palate flat;

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internal nostrils anterior, with a short, rather deep oblong concavity behind each, separated by a strong central ridge. Alveolar surface narrow, linear, with a slight sunken groove, edged internally by a slightly raised sharp edge. Lower jaw slender; upper surface slightly prominent in front, with a sharp edge having a slightly concave linear depression on the inner side. Toes short, strong.

Specimen in spirit in the British Museum. Skull ovate rhombic, rather thin, sides of the face flat, erect; nose short; orbit large, subsuperior, on the outer edge of the crown; crown rhombic, produced, and acute behind; rather longer from the hinder edge to the hinder edge of the orbit than from that part to the end of the nose; zygomatic arch thin, flat, dilated, forming part of the crown in front, narrow, and only attached to the narrow front part of the small subtrigonal tympanic cavity; upper jaw with a narrow double edge, the edges parallel and separated by a rather deep narrow groove; lower jaw moderate, nearly erect and with a narrow simple edge rather produced into an acute point in front. Palate flat, broad, with a triangular flat plate over the interior nostrils in front, and with a slight central keel with a slight concavity on each side just behind the openings of the internal nostrils. Toes short, imbedded in the skin to the base of the claws.

Upper jaw with a slight notch, and two small teeth in front; lower jaw simple, rather narrow (pale, spotless); crown with a spot on each side in front of eye; crown with two diverging lines, the outer commencing over the orbit; temple behind the eyes pale, with three parallel longitudinal short streaks of unequal length. Toes short, strong, webbed, with only two or three short scales on upperside of each toe, scaly above; front of fore legs unequal-sized, some large polygonal scales. Hind foot rather elongate, narrow; toes very short, webbed, the second and third longest; the second rather longest, and the two others small; one and four equal, very short.

Two half-grown specimens, in spirits, in the British Museum, from Brazil, collected by Mr. Bartlett.

The crown of the head black, with a diverging elongated streak on each side from the eyebrows to the occiput, and with a spot on the outside of the middle of the occiput; sides of the neck and throat pale, with very many narrow black streaks; thorax black, or black-olive; the sides of the sternum and the underside of the margin of thorax pale; the underside of the marginal shields and the marginal end of the sternal shields over the lateral processes yellow, with narrow black-brown streaks of a peculiar pattern, but varying in the specimens and shields; in some of the hinder marginal shields the spots are irregular-shaped, with a marginal ring. Toes very short, strong, nearly enclosed in the skin to the claws.

This pattern entirely disappears in the older specimens.

4. Rhinoclemmys Bellii.

Rhinoclemmys Bellii, *Gray*, *Ann. & Mag. N. H.* 1863, xii. 182.
Testudo scabra, *Bell*, *Test.* t. 1, 2 (adult).

Head with a spot on each side of the nose and of the occiput, and with a sinuous urn-shaped band on the crown, over the orbits and temples.

Hab. Tropical America.

The figure differs from any species we have by the superciliary bands being united by a short transverse band in front between the eyes.

5. Rhinoclemmys melanosterna. B.M.

Shell black, one-keeled; the first vertebral plate longer than broad, truncated behind; second and third six-sided, about as broad as long, the fourth broader than long; the keel low, rather interrupted; the areola of the dorsal and marginal shields posterior; the margin rather acute, slightly bent up in front and on the sides; the nuchal shield more distinct; the sternum flat, black, with rather paler edges to the shields; the sterno-costal slope rather convex, pale yellowish; the under surface of the marginal plates pale; the axillary plate moderate, the inguinal plate small, both pale-coloured. The head moderate, rather acute in front, black, with a distinct bright yellow streak diverging over the eyes and extending from the nostril to the back of the head. The legs and tail brown, with black spots, forming more or less distinct streaks; toes 5 . 4, short, strong, subequal, covered with distinct band-like scales; the claws strong, conical, black.

Geoclemys melanosterna, *Gray*, *P. Z. S.* 1861, p. 205; *Ann. & Mag. N. H.* 1861, viii. 336.
Emys scabra, no. 1, *Gray*, *Cat. Sh. Rept.* 78.
E. dorsalis, *Gray*, *Cat. Sh. Rept.* 32, t. xiv. *a* (not *Spix*).
Rhinoclemmys melanosterna, *Gray*, *Ann. & Mag. N. H.* 1863, xii. 182.

Hab. East coast of Tropical America; New Granada, River Buenoventura (*J. O. Goodridge, Esq.*); Gulf of Darien; Cherunha.

The head with a continuous band on each side, from

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the nose to the temple. Neck with four broad black streaks on the sides; fore legs pale, with some black stripes. One of the bands on the neck arises from the streak on the face under the eyes, and the upper one from the dark upper margin of the streak on the sides of the head.

It is easily known from the other described species by the black colour of the upper and lower surface and pale-yellowish sides, and the distinct bright-yellow superciliary streak on each side of the head, extending from the nostril to the occiput.

One species has the dorsal keel pale, and the head and neck with several pale bands or streaks. The toes are short, conical, without any web; the second and third hinder toes are the least, and nearly equal. I propose to call this group *Callopsis*; but I have since found that they have been named *Rhinoclemmys* by Fitzinger.

Emys dorsalis of Spix, Bras. T. ii. t. 9. f. 1, 2, which is described and figured from a young specimen, seems to be different from those here described.

6. Rhinoclemmys ——?

A young specimen in spirits, presented to the British Museum by Sir Andrew Smith.

Shell dark brown; sternum and underside black; outer edge of the marginal shields and the sides of the sternum yellow; the underside of the posterior marginal plates with a central transverse yellow band.

Head blackish, a narrow band on the sides of the nose to the orbit, an oblique one on the upper edge of the beak in front of the orbit, a row of 4 or 5 small spots on forehead between orbits, a spot at the back edge of the eyes, a spot under the back edge of the eyes, an oblong streak on each side of the temple, and two oblong spots on the back edge of the orbit to the side of the neck, the hinder margin of the under beak and two larger spots on each side of the chin, and many small spots on the gullet, placed more or less in longitudinal lines, yellowish or white.

Hab. ——?

Tribe II. EMYDINA.

Toes strong, short, spreading, covered above with bands of transverse shields, united by a narrow web to the claws. Jaws with a narrow alveolar surface. Internal nostrils in front of the palate. Head covered with a thin, hard skin. Eyes subsuperior, often with a dark spot on each side of the pupil. Feet covered with thin scales or bands.

All the North-American species of water *Emys* described and figured by Holbrook have a spot, on the iris, on each side of the pupil, giving the appearance of a horizontal band across the eye.

My experience as a student of Tortoises does not agree with the opinion expressed by Professor Agassiz, "that there are genera among our Emydoids in which neither the tint nor the pattern of coloration affords any specific characters" (vol. i. p. 432, footnote). It is no doubt true that the tint of colouring is not only liable to vary with age, but is also influenced by the peculiarities of the locality, as the purity and clearness, or muddiness, the stillness or current of the water in which they happen to be located; but as regards the pattern, it is far otherwise. And I cannot think that Professor Agassiz would have made such an observation if he had studied the subject with sufficient care, or even had worked out the observations which I have made on this subject in the Catalogue that he was criticising; for he would there have seen that some of the groups which he has called genera are separated and characterized by the pattern of the colours.

The pattern, to be understood, should be studied in the young animals, and traced up through all the stages until they are full-grown; for in the full-grown and more adult or aged specimens the colour is apt to become suffused, and the distinctive character of the pattern more or less obscured, or rendered more difficult to analyze; and I am satisfied that the best specific characters of the species are to be derived from such a study.

But not only does the pattern afford good specific characters, but, as far as I have been able to examine them, it seems to give some of the best characters to separate the species into natural groups, either genera or subgenera, as the student may be inclined to regard them. Thus the best character for the group of which *E. ornata* may be considered the type, is furnished by the fact that there is one eye-spot under each shield; and an excellent character to separate the species is the position which this spot occupies on the shield in the young and the older specimens, as marked in my Catalogue above cited (p. 24).

As examples of the assistance which the distribution of the colouring-matter, or the pattern, affords in the distinction of the genera, I may observe:—The underside of the margin of most coloured American Emydoids has a series of eye-spots. In *Graptemys* these spots are situated

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one on the hinder margin of each of the marginal shields; in all the other genera the centre of each spot is on the suture between two neighbouring marginal shields, the spot being on the middle of a marginal bone, and the sutures of the horny shields alternating with the sutures of the bones. The genera *Chrysemys* and *Deirochelys* have a distinct continuous vertebral line, not found in any of the other genera, *Chrysemys* being peculiar in having a very distinct well-marked pale edge to the dorsal shields, while *Deirochelys* has a dark spot surrounded by reticulated lines on each shield.

The variegated species of the genus *Trachemys* (if the genus ought not to be restricted to those species) and *Pseudemys* (*Ptychemys*, Agassiz) have several eye-spots, which are often more or less confluent and separated by pale or bright-coloured lines under each dorsal shield, the former genus having a convex horny lower beak, and the latter a flattened lower jaw with a small thin lower beak and broadly webbed toes.

The genera *Callichelys* (of which *Emys ornata* may be considered the type) and *Malaclemmys* have a single eye-spot, surrounded by regular concentric rings, under each dorsal shield. The *Callichelyes* have a hard thin skin on the head, and the centre of the rings approaches the hinder edge of the shield as the shields enlarge. Some specimens of this genus have a pale streak down the centre of the nuchal plates. The *Malaclemmyes* have a soft fleshy skin on the head, the centre of the spot remains in the middle of the shields, and the feet of the latter are largely webbed.

The genera *Deirochelys* and *Graptemys* have a single eye-spot under each dorsal shield, which is surrounded with narrow polygonal rings, sending out anastomosing cross lines to the margin. *Deirochelys* has a central continued vertebral streak, not found in *Graptemys*, which is peculiar in having a nodulous vertebral keel invested with oblong rings.

The genus *Chrysemys* is at once known by the pale margin to the dorsal shields, and the continuous vertebral streak.

Even the coloured lines on the fore legs seem to be characteristic of genera. In *Trachemys*, for example, the upper streak is continued on to the second toe; and in *Pseudemys* it is bent and continued on to the third or middle toe.

The *Nicotees*, or West-Indian Emydoids, have a nearly one-coloured back of the shell, with dark spots on the margins of the shields. In the Catalogue (p. 31) I pointed out the difference in the form of the head and skull of the two species, *E. decussata* and *E. rugosa*. Professor Agassiz refers the first to the genus *Ptychemys*, and the latter to *Trachemys*. They appear to be rather aberrant species of these genera, without colour, at least in the adult state. I have never seen young specimens of either. Do they in that state show the pattern which is typical of these genera? for it is the younger animals that have the colours most distinctly marked, and on which their disposition is best studied. It is therefore more remarkable that Professor Agassiz should make the statement that is here quoted, as he has studied these animals in their young state, and figured the newly hatched specimens of most of the North-American species; but the pattern, in some of the figures, is not so distinct as it might be, or as it is in the specimens, even when they have been preserved in spirits.

In the 'Catalogue of Shield Reptiles' will be found several additional observations showing the coloration of the species of the different genera.

* *Zygomatic arch imperfect, not reaching the tympanic cavity.*

6. MELANOCHELYS.

The thorax oblong, three-keeled. Vertebral plates broad, six-sided. Skull rather depressed; zygomatic arch imperfect, tapering behind, and not reaching the tympanic bone; lower jaw weak; the alveolar surface narrow, linear. Toes strong, webbed to the claws. Shell, back three-keeled. Vertebral shields elongate, hexangular.

Melanochelys, *Gray*, *P. Z. S.* 1869, p. 187.

1. Melanochelys trijuga. B.M.

Shell blackish brown, with three yellow keels, the yellow of the keels and sides of the sternum becoming broader when worn; vertebral plates as long as broad.

Emys trijuga, *Gray*, *Cat. Shield Rept.* 20, 77, tab. vi.
Melanochelys trijuga, *Gray*, *P. Z. S.* 1869, p. 187, f. 6 (skull).
Jun. Geoclemmys Sebæ, *Gray*, *Cat. Shield Rept.* 18, 77; *P. Z. S.* 1869, p. 188.

Hab. India, Ceylon (*Kelaart*).

A young specimen in spirit in the British Museum. Nose rather produced, shelving to the lip below, triangular, soft, in a notch on the upper edge of the upper beak; alveolar process linear, marginal; upper beak with a straight edge and a very slight acute central notch, lower

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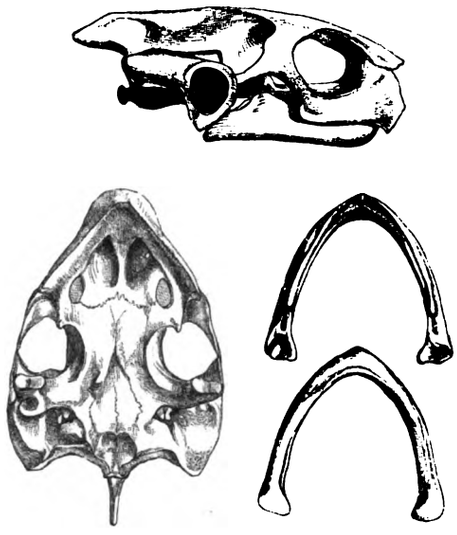
hooked and acute in front. Toes short, included in the skin to the base, but slightly separate, conical, with a central series of narrow six-sided scales above; web very slight, if any.

Skull of *M. triguga* (as seen through the skin in the stuffed specimen) ovate, elongate, triangular in front: sides of the face nearly erect; orbit lateral, subsuperior, large; nose rather narrow; crown rather convex, elongate rhombic, narrowed and produced behind; from the hinder point

Fig. 12.



Melanochelys trijuga.

to the back edge of the orbits more than once and one-half the distance of the latter from the end of the nose; zygomatic arch rudimentary, very slender, linear, extending from the middle of the back edge of the orbit to the upper part of the front edge of the large tympanic cavity, which has a narrow, rounded edge; sheath of the upper jaw with a simple straight edge, without any central hook; the lower jaw moderately strong, covered in front with a convex horny sheath. Toes strong, included in the skin to the claws, covered above with band-like shields.

A skull received from Mr. Oldham, which appears to belong to this species, may be thus described:—Skull depressed, nose nearly erect from upper lip; crown rather convex, tapering behind; orbit large, circular, lateral, subsuperior; zygomatic arch *imperfect*, rather broad in front, about half as broad as the back edge of the orbit, and tapering off behind just before it reaches the upper edge of the small circular tympanic cavity; palate flat, broad, with a short shallow concavity behind each internal nostril; the lateral edge of the upper jaw nearly straight, with a slightly produced broad central beak, and with a narrow alveolar plate having a slight groove parallel to the short outer edge for the greater part of its length; lower jaw weak, erect on the side, shelving in front, with a central conical prominence in front, and with a straight, thin, sharp edge, without any dilatation of any kind.

The skull is figured as *Emys trijuga*, Gray, Cat. Shield Reptiles in B.M. t. 37. f. 2 ("*E. subtrijuga*," figure not good, zygomatic arch too broad and extending to the ear-bone).

Young specimen, in spirits, presented by Mr. Barnes:—Black; the head varied with irregular white spots, with a lunate white streak on the nose and a spot behind it, a streak on each side of the crown, and a spot on each side of the temple; shell black, with a narrow white line on the edge of each marginal shield; sternum black; the outer portion of each shield white.

2. Melanochelys Sebæ. B.M.

Shell blackish brown, three-keeled; the sides of the thorax more or less pale. Vertebral shields of the older specimens much longer than broad.

Emys trijuga, *Günther*, *P. Z. S.* 1869, p. 501.

Hab. Ceylon (*Kelaart*); Poonah, Kamandroog, India.

The younger specimens are brown, with the underside more pale, which become darker in older specimens.

** *Zygomatic arch complete.*

7. MAUREMYS.

The head elongate, covered with a smooth skin; nose with the nostrils near the upper edge; crown flat; eyes lateral, large, and very prominent; pupils circular. Upper beak high, lower edge slightly arched, with an acute notch in the centre. Lower beak convex, rounded below in front, scarcely reaching the angle of the mouth. Palate slightly concave. Inner nostrils near the middle of the palate, oblong, with a concavity behind each. Alveolar edge of the upper jaw with a deep groove, with a strong acute ridge on the inner side, extending nearly the whole length of the margin. The alveolar edge of the lower jaw sharp and narrow, broader, shelving inwardly in front.

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1. Mauremys fuliginosa.

Mauremys fuliginosa, *Gray*, *P. Z. S.* 1869, p. 500.
Emys fuliginosa, *Gray*, *P. Z. S.* 1860, p. 223, t. xxx.
? E. areolata, *Dum. Arch. du Mus.* vi. t. xiv.

Hab. North Africa? Peten, Central America (*Duméril*).

This Terrapin (*Emys fuliginosa*) differs so much in the form of the jaws that it is necessary to consider it the type of a new genus, characterized by the depth and length of the groove of the upper jaw and the sharp simple edge of the lower jaw.

Depressed, flexible, black. Shields convex, rather irregular, with deep, irregular, subconcentric grooves of unequal depression. Underside black, with white blotches on the front margin of the sternum and on the inner edge of the central marginal plates near the sterno-costal suture, and a small irregular white blotch on the middle of the underside of the front marginal plates. Head rather depressed; crown covered with a continuous, smooth, rather horny skin; jaws mottled with sinuous white lines or spots; sides of the neck with narrow white lines; the chin and throat mottled with broader white streaks, often interrupted or coalescing, or short and sinuous; the temple with a distinct round white spot, with two or three small white dots in front of it; the tympanum with a central white spot, and edged with a white streak in front. Legs and feet black, the front of the fore legs varied with white irregular streaks or spots, especially on the inner side, and with a white streak down the centre of the upperside of each toe. Toes distinctly webbed; claws rather elongate, curved, acute, black, with pale edges; the toes with a single central series of larger scales above. Fore legs with four large conical scales on the outer part of the upperside, and with a cross series of three square scales on the underside of the wrist; the hind legs and feet covered with equal, small, triangular scales. Tail conical, black, with two transverse streaks before the vent.

The specimen described was received by the British Museum from the Zoological Society. It died in the Gardens, and is believed to have been one of five specimens brought from Egypt by C. W. Domville, Esq., in 1852; but this is not certain. It is quite distinct from any which have hitherto come under my observation.

8. OCADIA.

Head oblong, elongate. The upper beak with a narrow, acute, central notch. Alveolar surface of the jaws rather broad, of the same breadth the whole length. The upper jaw with a well-marked submarginal rib, which is separated by a small cavity in front. The under one with a rather broad submarginal groove occupying nearly the whole length of the surface. "Pupil small, without any lateral spot."—*Reeves.*

Cavity of the thorax not contracted at the ends. Vertebral shields—second, third, and fourth hexangular, fourth the largest, first pentangular. Nuchal plate distinct.

Hab. Asia.

1. Ocadia sinensis. B.M.

Emys sinensis, *Gray*, *Cat. Sh. Rept.* 21, t. 7 & 10.
Young, *Swinhoe*, *Ann. & Mag. N. H.* 1863, xii. 219.
E. Bennettii, *Gray*, *Cat. Sh. Rept.* 22, t. 10 (adult).

Hab. Formosa (*Swinhoe*).

See observations on the growth of this species, *antea*, p. 28.

9. SACALIA.

Head elongate, rather slender; crown rhombic. Nose truncated, rather high. Beak slightly crenulated. Alveolar plate of the upper jaw narrow, with a slightly raised inner margin; the lower linear, rather broad, with a sharp inner edge. Upper jaw entire. Thorax solid, obscurely keeled, most so behind. Nuchal shield distinct. Vertebral plates:—first transverse, broad; second and third hexangular, broader than long; the third broadest; the fourth irregularly hexangular, the front edge broad, the hind edge not half the width of the front. Toes very short, webbed narrowly; claws 5 . 4, very strong. "Iris without any lateral spot."—*Reeves.*

1. Sacalia Bealii. B.M.

Emys Bealii, *Gray*, *Cat. Sh. Rept.* 21, t. 8.

Hab. China.

10. REDAMIA.

Head elongate, oblong. Nose very short. Eyes lateral, anterior. Alveolar plate of the upper jaw linear, with a ridge on the inner margin, which is higher and broader behind; of the lower jaw rather broad, linear, concave, with a sharp outer edge, and with a central longitudinal groove for about two-thirds of its hinder part, rather bent

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up in front. Shell depressed, oblong, expanded behind. Shields very thin, semitransparent. Nuchal shield distinct, lateral. Marginal shields narrow; hinder ones expanded. Vertebral shields:—first nearly four-sided, broader than long, rounded in front; second and third hexangular; third largest; fourth irregularly hexangular: the front edge broad and the hind edge very narrow. Toes very short; claws 5.4, strong, the three middle front claws elongate, produced.

1. Redamia olivacea. B.M.

Emys olivacea, *Gray, Cat. Sh. Rept.* 30, t. 12 c.

Hab. ——?

11. EMYS.

The shell olive, often with a blotch of brighter colour on each dorsal plate. The under edge and margin black.

Alveolar process of the upper jaw of *Emys caspica* narrow, with a slightly raised inner margin; the lower linear, rather broad, with a sharp inner edge. Upper jaw nicked in front.

1. Emys japonica. B.M.

Emys japonica, *Gray, Cat. Sh. Rept.* 22.
Duméril, Arch. du Muséum, vi. 220.

An adult specimen from Japan, in spirit. Thorax oblong; dorsal shields broad, six-sided, with a well-marked large central areola of the same shape, and with a few concentric ridges and more or less distinct radiating grooves and some rather nodulous radiating ridges, dark brown or black, varied with orange rays or lines; the areola of the marginal plate near the outer hinder edge; sternum and underside of the margin uniform black. Legs and tail uniform black. Head ovate rhombic, longer than broad; crown and sides olive-black; neck with longitudinal ridges and conical short spine-like scales, those on the back of the neck being the largest; crown flat; eyes lateral, subsuperior; nose truncated, rounded in front; edge of the beak even, without any central notch; lower beak weak; alveolar surface narrow, linear, with a submarginal ridge on the upper, and groove on the lower jaw; lower jaw scarcely thicker, with the edge produced into a sharp point in front. Tail conical, elongate, flat above, with a pale streak on each side of the upper surface. Front legs covered with rather large scales; the hind legs and feet spinulous.

2. Emys caspica. B.M.

Emys caspica, *Gray, Cat. Sh. Rept.* 22.
Clemmys caspica, *Gray, P. Z. S.* 1869, p. 190.
Wagler, Nat. Syst. Amph. t. 5. f. iv., v., skull figured.

Var. *arabica.* B.M.

A specimen in spirit (from Arabia Petræa?), purchased of the Rev. H. B. Tristram. Thorax oblong; nuchal plate broad; the upper surface of each marginal plate with a subcentral darker-edged cross streak, sometimes dilated and extended into a streak along the upper edge of the plate; back pale olive, with indistinct paler yellowish reticulated lines edged with black; sternum and underside of the margin black, with irregular-sized subtriangular yellow spots on the outer side of each sternal shield, and a pale blotch on the outer edge of the inguinal shield; head and neck olive, sides of the neck and throat with numerous black-edged pale parallel streaks; legs with irregular rather broad black-edged pale streaks; beaks olive, rounded in front; upper with a slight acute central notch with a slight tooth on each side of it.

3. Emys pannonica. B.M.

Emys pannonica, *Michahelles.*
E. caspica, *Gray, Cat. Sh. Rept.* 22, specimens *l* & *k*.

Hab. Xantos (*Sir Charles Fellowes*).

4. Emys Fraseri. B.M.

Emys Fraseri, *Gray, P. Z. S.* 1869, p. 643.
E. caspica, *Gray, Cat. Sh. Rept.* 22, specimens *h* & *i*.

"In the British Museum there is a specimen of a young Terrapin brought by Mr. Fraser from North Africa, which is very similar to *E. flavipes*, and has the same black underside of the margin; but its neck has many much narrower streaks, and there is no spot behind the eye or ring round the ear. This specimen appears to indicate the existence of another species, which may be called *Emys Fraseri*."

5. Emys Tristrami. B.M.

Head oblong trigonal, half as long again as wide (to the end of crown-ridge); eyes subsuperior; temple and jaws with a few dark-edged pale sinuous lines; temple, between orbit and the wide zygomatic arch, short, flat; lower jaw strong; alveolar surface of both jaws linear, marginal; internal nostrils subanterior.

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Emys Tristrami, *Gray*, *P. Z. S.* 1869, p. 190.

Hab. Holy Land.

See also *Emys* undetermined, Gray, Cat. Sh. Rept. in B. M. t. 35. f. 3 (skull).

6. Emys flavipes. B.M.

The crown olive, sides of the face greenish, with a narrow streak from the nostril, through the eye, extending on the side of the back of the neck. Another streak from the lower side of the eyes to the angle of the mouth; a short streak from the side of the beak. The under beak with a forked streak on each side, a broader transverse band behind it; one long oval spot on the hinder part of the side of the jaw. A line on each side of the temple; an oval spot behind each eye; and a ring round the ear, extending behind into a longitudinal streak. Pupil round, with a square spot on each side, forming a band obliquely across the eye; neck olive, with obscure reddish spots; sides of the neck and throat with orange streaks. Legs black, varied with orange; the lower side of the fore legs orange; the tail tapering, with orange lines. Thorax oblong, bluntly keeled; the keel narrower and more prominent behind. Above pale olive-brown, slightly waved with reddish on the middle of the shield, more marked in the middle of the first vertebral shield, where it makes a distinct square spot; the lateral margin slightly revolute, and the hinder edge entire; the underside of the marginal shields and the sternum black, with more or less white on the lateral margin of the latter; the suture between the abdominal and marginal plates marked by a distinct narrow orange streak.

Emys flavipes, *Gray*, *P. Z. S.* 1869, p. 643, t. 50.

The different specimens vary in the quantity of white on the sternum; in one the sternum is nearly white, clouded with black.

The *Mauremys fuliginosa* (*antea*, p. 35) has the markings on the head and neck somewhat similar to those of *Emys flavipes*, but sufficiently distinct to define this species, which is also at once known by the depressed and nearly uniform black shields of the shell.

7. Emys laniaria.

The head short, broad; nose very short, broad, rounded; the eyes very large and prominent, on the sides of the head; front of face high; beak thick, convex; lips convex on the edge; central notch simple; lower beak short, convex externally; crown dark olive; neck minutely granular, blackish olive above, with some very narrow reddish lines beneath; sides and undersides reddish, with many more or less wide black and green lines; those on the back of the throat widest. Legs dark olive; fore legs olive, with large, irregular, prominent tubercles in front, and with a broad irregular streak on the lower half of the front side; the front toes or fingers short, thick, united by a narrow fleshy web to the claws, each finger with a series of larger triangular scales on the upper surface; claws short, acute. Hind feet large, square; the toes thick, united by a narrow fleshy web to the claws, and with one or two scales on the upper part of the base. Tail short, thick, granular, with some whorls of distant minute spines near the base (tip injured); the hinder part of a dark olive, with reddish streaks and minute spines. Thorax depressed, rounded above, the side margins slightly revolute, dark olive-green above; the shields blackish horn-coloured, smooth or slightly annulated, and irregularly convex; the third, fourth, and fifth vertebræ slightly keeled; the marginal shields blackish olive, very obscurely and irregularly varied with reddish brown and blackish beneath. The sternum flat, truncated in front, and notched behind, raised on the sides, black, more or less varied with white on the margin of the front and hinder lobes, and on the sides of the central plates.

Emys (Mauremys) laniaria, *Gray*, *P. Z. S.* 1869, p. 499 & 500.

This animal is strictly carnivorous, and eats most ravenously in confinement.

This Terrapin agrees in the dull dark plain colour with a species described by me in the 'Proceedings of the Zoological Society' for 1860, under the name of *Emys fuliginosus* (p. 232, Rept. t. xxx.), which differs from it in the form and length of the head, in the markings on the head and neck, and in having a more depressed shell.

Mr. Bartlett obtained this Tortoise from a dealer; it had passed through several hands, and was therefore without any reliable history or habitat.

See Emys incisa, *Bocourt*, *Ann. Sci. Nat.* 1868, x. p. 121.

"Cette espèce, qui a de la ressemblance avec l'*Em. insculpta*, Leconte, et l'*Em. pulcherrimus*, Gray, provient de l'Union, un des ports de Salvador. Longueur de la carapace $0^{m}\cdot146$; largeur $0^{m}\cdot116$."

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12. EMMENIA.

The dorsal shields with two rings. The underside and marginal plates each generally marked with two black spots.

1. Emmenia Grayi. B.M.

"Shell much depressed, with an obtuse median ridge along all the vertebral plates; no costal ridge (in the adult); the upper shell is subtruncated anteriorly, and provided with a very small notch posteriorly; lateral margins slightly reverted, posterior not serrated; width of the sternum between the maxillary and inguinal incisions equal and more than one-half of its length; sternum truncated in front and with a deep, obtuse-angular incision behind. The areolæ have disappeared; but there is still a large fontanelle visible in the middle of the sternum; nuchal plate broad, quadrangular, broader behind than in front; all the vertebrals broader than long; the first quadrangular, with the front margin convex, and with the hinder straight; caudal plates nearly square; gulars longer than broad, the suture between them being much longer than that between the postgulars; postgulars, pectorals, and abdominals nearly equally long, but much shorter than the præanals; the suture between the anals is rather shorter than their posterior margin; axillary and inguinal plates large. Upper parts chestnut-brown, each vertebral and costal plate with an 8-like yellow figure; each marginal plate with a yellow 0-like figure, the enclosed brown spot lighter in the centre. The flat portion of the sternum brownish black, each plate with a narrow yellow margin; each marginal plate with a narrow black margin on the lower surface, and with a larger or smaller round black spot."

Emys caspica, var. *a*, *Gray*, *Cat. Sh. Rept.* 23.
E. Grayi, *Günther*, *P. Z. S.* 1869, p. 504. t. xxxviii.
Gray, *P. Z. S.* 1869, p. 444 (not *Bocourt*, 1864).

"The shell of a single example, $3\frac{5}{8}$ inches long, was obtained at Bussora. Dr. Gray directed my attention to a young example in the British Museum obtained on the Euphrates Expedition. It is preserved in spirits, the shell being $1\frac{3}{4}$ inch long. The shell is coloured as in the adult, but provided with a distinct costal ridge. Neck with numerous parallel yellow longitudinal bands, some of which advance along the side of the head to the tip of the snout. Legs and tail (which is $1\frac{1}{3}$ inch long) with yellow stripes. Toes broadly webbed."—*Dr. Günther*, *P. Z. S.* 1869.

In the British Museum is a young specimen of Terrapin in spirit that was brought home in the Euphrates Expedition, which is somewhat like the above, but there are indications of dark rings on the discal plates. The sternum is black, edged with white; the whole of the sternum, costal process, and the underside of the marginal shield is white, there being two small round black spots on the underside of each of the five front marginal shields. The head and neck are beautifully marked with very regular pale streaks, but there is no spot behind the eye, and no ring round the margin of the ear. This indicates the existence of a very distinct species; and Dr. Günther thinks that it is the young state of the *Emys Grayi*, which he has lately described from the adult shell, without the animal.

13. CHRYSEMYS.

The iris with a spot on each side of the pupil, forming a cross band. Alveolar surface linear, with a well-marked groove on each side, except in front. The dorsal shields olive, surrounded by a yellow margin. The sternum often variegated with olive.

Chrysemys, *Gray*, *Cat. Tort.* 27 (1844); *Ann. & Mag. N. H.* xii. 181; *Cat. Sh. Rept.* p. 32; *P. Z. S.* 1869. *Agassiz*, *Contrib.* i. 438 (1857).

Chrysemys frequents ditches, ponds, and sluggish rivers, basking on the banks or fallen logs. It hibernates early.

Skull of *Chrysemys* in the Museum of the College of Surgeons, no. 964. Skull rather solid, crown very flat; orbits large, oblong, forming part of the crown-edge; nose-hole moderate, labial edge even, with two small close teeth quite in front; zygomatic arch broad, strong, convex externally; palate flat; internal nostrils quite anterior, with a concavity in front between, and with a slight oblong concavity behind each, separated by a slight raised central ridge; lower jaw depressed, rather broad in front and on the sides, rather convex externally (the jaws are fastened together).

There is also a skull of a smaller specimen, no. 967. The alveolar surface of the upper jaw linear, with a slight narrow raised ridge parallel to the outer edge, and occupying the middle, half its length. Lower jaw depressed; alveolar surface linear, with a well-marked groove with a sharp raised edge on each side for the greater part of its length, except in front, where the jaw is thinner, simple, and acute.

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1. Chrysemys picta.

Chrysemys picta, *Agassiz, Contrib.* 438, t. 1. f. 1–3, t. 3. f. 4, t. 9 *c.* f. 22, 23.
Gray, Ann. & Mag. N. H. xii. 181; *P. Z. S.* 1869.
Emys picta, *Owen, Cat. Osteol. Mus. C. S.* p. 189. no. 964 (skull and thorax).

Hab. N. America.

"Eyes large; iris golden, with a black band."—*Holb.* 76.

2. Chrysemys Bellii.

Chrysemys Bellii, *Agassiz, Contrib.* 439, t. 6. f. 8, 9.
Gray, Ann. & Mag. N. H. xii. 181; *Cat. Sh. Rept.* 33.
? C. oregonensis, *Agass. Contrib.* 439, t. 1. f. 8, t. 5. f. 1.
C. picta, var., *Gray, P. Z. S.* 1869.

3. Chrysemys marginata.

Chrysemys marginatus, *Agassiz, Contrib.* 439, t. 1. f. 6, t. 5. f. 1.
Gray, Ann. & Mag. N. H. xii. 181.
C. picta, var., *Gray, P. Z. S.* 1869.

4. Chrysemys dorsalis.

Chrysemys dorsalis, *Agassiz, Contrib.* ii. 490.
Gray, Ann. & Mag. N. H. xii. 181.
C. picta, var., *Gray, P. Z. S.* 1869.
C. Orbigniensis, *Agassiz, Contrib.* 444, t. 3. f. 1, 3 (young).
C. Nuttallii, *Agassiz, Contrib.* ii. 642.
Gray, Ann. & Mag. N. H. xii. 181.

I do not say these local varieties are not distinct: but they are not characterized; and the series in the Museum shows that the species is very variable, and seems to include some of them.

I formerly separated *C. Bellii*, which, when I had only a single specimen, I thought probably might be distinct.

14. DEIROCHELYS.

"The head small, long, and narrow; snout pointed. Eyes prominent and large, pupil black; iris golden, with a black band passing longitudinally through it. Upper jaw slightly emarginate; lower entire, with a hook in front; neck of great length. Shell oval, broadest posteriorly, carinate, longitudinally rugose; the anterior vertebral plate almost pentagonal and broadest in front, the second and third hexagonal, the fourth hexagonal, broader and rounded in front. Nuchal very small, oblong; the fore arms short, rounded, covered with large scales placed in cross lines."—*Holbrook*, 59.

Deirochelys, *Agassiz, Contrib.* i. 414 (1857).
Gray, Ann. & Mag. N. H. xii. 1863, p. 180.

Professor Agassiz regarded this genus as forming a family distinct from the other *Emydidæ*; but he only observes that it has a longer neck.

1. ? Deirochelys reticularia. B.M.

Deirochelys reticularia, *Agassiz*, 414, t. 1. f. 44; 416, t. 2. f. 1–3 (young).
Emys reticularia, *Gray, Cat.* 27.

A young specimen in spirits, received from Mr. A. Russell from North America under this name is most beautifully ornamented, both on the back and sternum, with dark-edged rings and irregular marks; the beaks are most beautifully ornamented with regular black-edged yellow streaks diverging from the nose across the lower beak, so as to form the lines on the throat; the underside of the lower beak is convex. The alveolar surface of the upper and lower jaws rather wide; the upper with a very slightly raised narrow submarginal ridge; the lower jaw with a regular well-marked continuous submarginal groove.

Tribe III. BELLIANA.

The head covered with a hard skin; the skin of the neck and limbs covered with very minute granular scales. The alveolar surface of the lower jaw narrow in front. rather widened behind.

15. BELLIA.

Skull very solid. The upper or alveolar surface of the lower jaw narrow, sharp-edged in front, wider and flattened on the hinder part of the sides. Internal nostrils subanterior. Skin of neck and limbs with very minute granular scales. Back of shell three-keeled; vertebral plates elongate, subtrigonal; the areola of the discal shields with a narrow longitudinal ridge.

Bellia, *Gray, P. Z. S.* 1869, p. 197.
Emys, section 1, *Gray, Cat. Sh. Rept.* 20.

Head very large, short, covered with a thin and hard skin, over the orbit and other fleshy parts covered with very small granular scales. Nose high, truncated in front; nostrils in the upper edge of the horny beak. Beak of the

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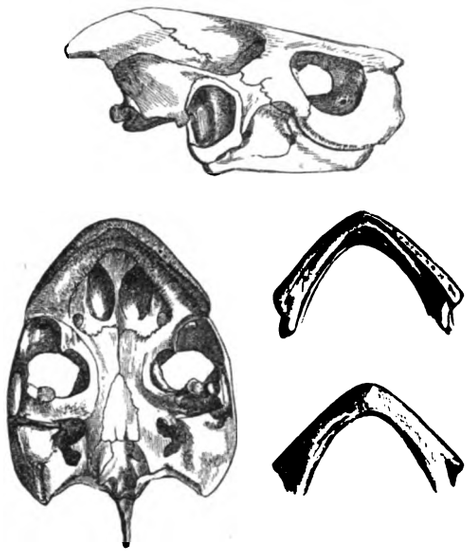
upper jaw high, convex, with broadly arched dependent sides and a central notch. Lower jaw strong, convex in front, with a central acute sharp-edged point. Thorax oblong. Back three-keeled. Vertebral plates elongate, subtrigonal. Areola of discal shields with a narrow longitudinal ridge. Toes strong, expanded, with transverse band-like shields, united to the claws by a narrow scaly web. Asiatic.

Skull solid. Nose-hole square. The front and sides of the upper lips shelving inwards. Orbit large, oblong, subquadrangular, lateral. Palate flat. Internal nostrils anterior, with a short oblong concavity behind each. Alveolar plates moderate, band-like, rather wider behind,

Fig. 13.



Bellia crassicollis.

rather concave. Lower jaw short, strong, convex in front, and wide and thick behind, with a conical central prominence and a broad flat alveolar edge that is broader behind and with a very slightly raised outer margin.

Bellia has the large head, with dependent lips, of *Damonia*; but the alveolar surface of the upper jaw is not so wide, and the inner nostrils are anterior.

1. Bellia crassicollis. **B.M.**

Emys crassicollis, *Bell.*
Gray, Cat. Sh. Rept. 20; *P. Z. S.* 1861, p. 140.
Theobald, Journ. Linn. Soc. Zool. x. p. 14.
E. nigra, *Blyth, Journ. As. Soc.* xxvi. 713.
Bellia crassicollis, *Gray, P. Z. S.* 1869, p. 197.

Hab. Cambogia (*M. Mouhot*, Aug. 1860); Sumatra; Siam (*Mouhot*); India (*Oldham*).

Skull (as seen through the skin of the stuffed specimen) broad, depressed, ovate, sides shelving outwards; orbit subsuperior, on the lateral edge of the crown; crown flat, rhomboid, broader in front, rather produced and narrow in the middle of the hinder edge, which is almost as far from the back edge of the orbit as that part from the end of the nose; zygomatic arch short, broad, convex, forming part of the crown, and wider than the back edge of the orbit in front, not quite so wide as the front edge of the tympanic cavity behind; edge of tympanic cavity rounded; sheath of the upper jaw very strong, and high in front and on the sides; lower margin truncated in the middle, and larger and arched on the sides; the lower jaw strong, short, broad in front, covered with a broad horny sheath. Toes strong, short, webbed to the claws, covered with band-like shields. Feet like those of the American *Emydidæ*.

Skeleton of a half-grown specimen in the British Museum, received from Holland as "*Clemmys sprengleri*." The head of the younger specimens is rather more slender and thinner than that of the adult.

A young specimen in spirit, sent with an adult and a half-grown specimen from Borneo, and presented by Mr. Dillwyn. The head is black, with an elongated yellowish white spot over each orbit, extended towards the nostrils, and a large round opake pure-white spot on each temple over the zygomatic arch, a triangular white spot on each side of the lower jaw, and a small white spot on each side of the head under the tympanum.

The head of the adult specimen has not these distinct spots; but the region of the orbit and temple is varied with white. Unfortunately, however, the older specimens are not in such a good state as the young one.

Two skulls in the Museum, sent by Prof. Oldham, are very solid; nose rather produced, conical; nose-hole in front large, four-sided; cheeks shelving outwards; crown flat, rhombic, narrow and acute behind; zygomatic process moderately broad, from back of orbit to the upper front half of the oblong tympanic cavity; orbit oblong, large. The labial edge of the upper jaw arched on each side and

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overlapping. The palate nearly flat, with a concavity in front behind each internal nostril. The alveolar plate broad, flat, smooth, broader behind, and with a slight oblong central pit and a larger central concavity behind it. Lower jaw very strong, short, with a narrow erect front edge ending in a central conical prominence; broad and flattened out behind, especially just before the condyle. The tympanic concavity opens into the larger cavity that occupies the whole of the mastoid bone.

A young specimen in the British Museum:—Black; hinder edge subdentate; head black, with a large oblong yellow spot on each side of the hinder part of the lower jaw; a small yellow spot on the front edge of each ear.

2. Bellia nuchalis. B.M.

"The head black; a yellow line over each eye, meeting over the nostrils; a yellow line under the eye and two behind the orbit."

Emys nuchalis, *Blyth, Journ. As. Soc.* xl. 1863, p. 35.

Hab. Java.

Section II. *The alveolar surface of the upper and lower jaws broad, expanded, covering more or less of the sides of the front of the palate, so that the internal nostrils open near the middle of the palate. Lower jaw strong. Toes webbed.* Hydroclemmys, *Gray, P. Z. S.* 1869, p. 185.

Fam. III. MALACLEMMYDÆ.

Head covered with a hard, thin, or rarely soft fleshy skin. The temporal muscles protected by a soft skin, and a well-developed zygomatic arch. Eyes lateral or subsuperior. Alveolar process of the upper and lower jaw broad, smooth, without any longitudinal ridges. Internal nostrils subcentral, behind the alveolar ridge. The sternum attached to the thorax by a bony symphysis, solid, and covered with twelve shields. Toes short, strong, webbed to the claws.

Synopsis of the Genera.

A. *Head covered with soft skin. Alveolar surfaces of the upper jaw only separated by a very slight groove in front.*

1. **Malaclemmys.**

B. *Head covered with a hard skin. Alveolar surfaces of the upper jaw very broad, and united together in front.*

2. **Damonia.**

C. *Head covered with a hard skin. Alveolar surfaces of the upper jaw moderately broad and separated in front by a deep central groove.*

3. **Eryma.** Shell not keeled.

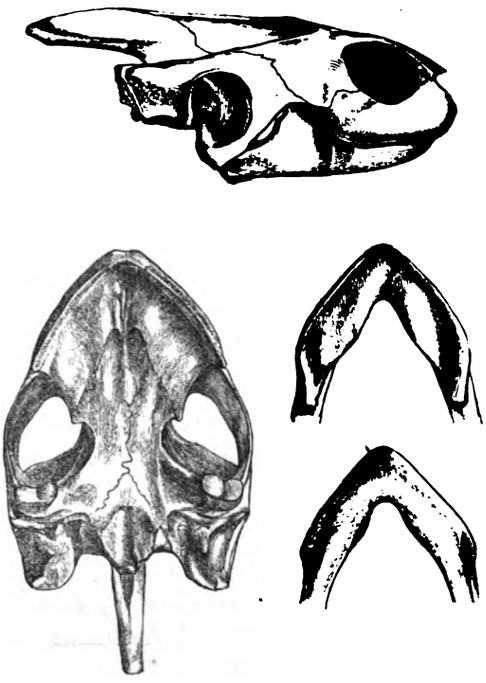
4. **Graptemys.** Shell keeled.

1. MALACLEMMYS.

Head covered with a soft skin. Eyes subsuperior; iris simple, without any spot on the sides of the pupil. The alveolar surfaces of the upper jaw very wide and produced behind, separated in front by a deeply impressed central groove. Alveolar surface of the lower jaw broad, concave, rather narrowed behind.

Malaclemmys, *Gray, Cat. Tort. Brit. Mus.* 28 (1844); *P.Z.S.* 1855, p. 197, 1869, p. 191; *Ann. & Mag. N. H.* vol. xii. 181; *Cat. Shield Rep.* 37.
Emys, § **, *Gray*, 1828.
Malacoclemmys, *Agassiz, Contrib.* i. 437; *Ann. & Mag. N. H.* i. 294 (1858).

Fig. 14.



Malaclemmys concentrica.

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Two skeletons in the British Museum. Skull broad, ovate trigonal, rather depressed, sides of the face rounded. Crown flat, rhombic, hinder end narrow, extended into a crest, as long from the hinder edge of the orbits as that part is from the end of the nose. Orbit lateral, superior, on the outer edge of the crown. Zygomatic arch strong, broad, convex, rather wider than the orbit in front, so much so that the circular tympanic cavity behind is rather contracted in the middle. The palate flat. Internal nostrils near the centre of the palate, from under a rather convex plate in front, and with a central keel in the wide sunken space behind them. The alveolar surface of the upper jaw very wide, quite simple, occupying all the front of the palate with a central triangular space, without any internal ridge. The lower jaw very strong, flattened out in front and on the sides of the front, without any gonyx, the upper edge simple, with a very broad, shelving, concave inner alveolar surface and an acute central point. Toes rather elongate, webbed to the claws, with band-like shields above.

Skull in the Museum of the College of Surgeons, no. 1057, without horny sheath. The palate flat. The alveolar process very wide, expanded, smooth, rather convex on the front part of the inner edge. The part of the palate behind the internal nostrils broad, slightly sunken, flat, with three rather thick ridges, the central one long, the side ones short. The lower jaw very strong, thick, bent up in the centre in front, and acute. The alveolar surfaces very broad, slightly concave the whole length of the sides. Length 1 inch 7½ lines, width 1 inch 5 lines.

1. Malaclemmys concentrica. B.M.

Malaclemmys concentrica, *Gray, Cat. Sh. Rept.* 37.
Malacoclemmys palustris, *Agassiz, Contrib.* i. 437, t. 1. f. 10–12 (young).

Hab. N. America.

Professor Agassiz truly observes, "this species varies most remarkably in its colour and sculpture, as well as in the size of the head,"—all characters used to separate other species of Terrapins.

Emys areolata, Dum. (Arch. Mus. vi. 223, t. 14), is also regarded as a variety from Central America.

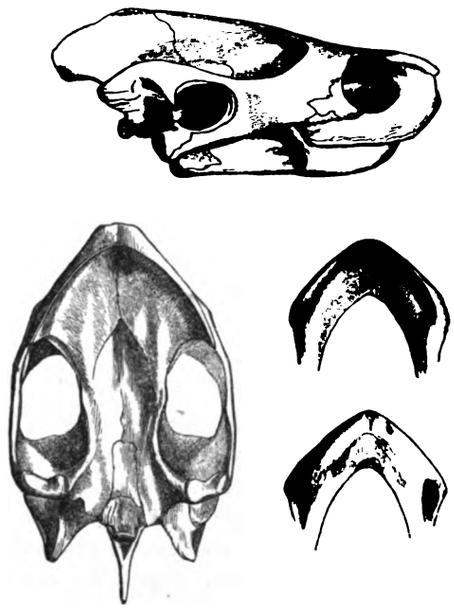
"Eyes small; the iris grey, approaching the colour of the skin. Hibernating in mud. Males smaller than the females."—*Holbrook.*

2. DAMONIA.

Damonia, *Gray, P. Z. S.* 1869, p. 193.

Head very large, covered with a hard thin skin. Nose high, truncated; nostrils in a small disk notched out on the upper edge of the very high convex upper beak. Eyes lateral, subsuperior. Sides of the face shelving outwards below. Zygomatic arch strong, wide. The labial edges of the upper beak slightly arched, bent inwards. Lower jaw very strong, convex and rounded in front below, with a strong, sharp-edged, broad central tip. The alveolar disks of the upper and lower jaws very broad; the upper flat, and united together by a linear suture, and the lower concave. The internal nostrils subcentral, with a short oblong sunken space behind each. The thorax oblong, more or less distinctly three-keeled; the vertebral shields six-sided, as broad behind as before; marginal plates dilated over the hinder limbs. Sternal plates regular. Toes strong, covered with band-like shields, united to the claws by a very narrow web covered with scales. Hind toes the longest.—Asiatic.

Fig. 15.



Damonia macrocephala.

The skull and palate similar to those of *Malaclemmys*, but the feet, shell, and head different.

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1. Damonia macrocephala. B.M.

Geoclemmys macrocephala, *Gray*, *P. Z. S.* 1859, p. 479, t. xxi., 1861, p. 139.
Emys trijuga, *Mus. Utrecht.*
Damonia macrocephela, *Gray*, *P. Z. S.* 1869, p. 193.
Emys macrocephala, *Günther*, *R. B. Ind.* 31.

Hab. Siam and Cambogia.

The skull (as seen through the skin in the stuffed specimen) has a very broad, strong, rather convex zygomatic arch between the orbit and the ear-cavity; crown broad, flat, trigonal, broader and truncated behind.

Skeleton in the British Museum. Skull large; nose rather produced, conical; crown flat, rhombic, short; orbit lateral, very large; zygomatic arch very broad, short; palate slightly concave; internal nostrils near the middle of the palate; alveolar surface of the upper jaw rather arched, very convex. The lower jaw curved upwards and acute at the tip, with a very broad, rather concave alveolar surface the whole of the length, broader and most concave in front.

There is a second skeleton, of a small specimen, of this species, which, from the bad state of the shell, must have been kept in confinement for a long time.

The shell oblong, rather depressed, entire, three-keeled, olive-brown; the keels subcontinued, ending abruptly on the hinder edge of the third lateral discal shield; the hinder lateral and central shield only marked with a slight convexity; the margin entire, yellow-edged; the underside yellow, with black triangular spots; the sternum flat, very indistinctly keeled on the side. Animal blackish olive. Head large; crown flat, covered with a single smooth plate, purplish brown, with two streaks from the middle of the nose, the upper edging the crown, the other the upper part of the beak, and with two streaks from the hinder edge of the orbit, the lower short and interrupted, extended on the temple, the upper broader and continued over the ear along the side of the neck; two close streaks under the nostrils to the middle of the upper jaw, and two broad streaks, dilated behind, down the front of the lower jaw, and continued on the edge of the lower jaw behind; the nape and hinder part of the side of the lower jaw covered with large flat scales; the rest of the neck and legs covered with minute granular scales; the front of the fore legs covered with broad band-like scales; the toes of the fore and hind feet rather short and thick, covered above with broad band-like scales.

The front vertebral plate is quadrangular, the front edge wider, rounded; second, third, and fourth vertebral shields six-sided, the second longer than broad, the fourth broader than long, the three hinder sides are longest; the fifth vertebral shield subquadrangular, the front sides being very narrow, and the hinder side very broad and slightly truncated. They have somewhat the external appearance, both in shape and markings of the head, of some specimens of *Cistudo amboinensis*, but belong to the genus *Geoclemmys*, and not to *Cistudo*.

2. Damonia Hamiltonii. B.M.

Geoclemmys Hamiltonii, *Gray*, *Cat. Shield Rep.* 17.
Damonia Hamiltonii, *Gray*, *P. Z. S.* 1869, p. 195.

Hab. India.

Skull (as seen through the skin of the stuffed specimen) ovate trigonal, sides flattened; orbit lateral, rather large; crown rhombic, rather convex in the middle, concave over the orbits, produced behind, about once and a half as long from the back edge of the orbits as from that point to the tip of the nose; zygomatic arch very short, broad, confluent with the crown above, and much wider than the orbit in front, as wide as the tympanic cavity behind; sheath of the upper jaw simple, without any central hook; lower jaw strong, convex, and covered with a horny sheath in front; toes enclosed in the skin to the claws, with band-like shields above, claws small.

A specimen in spirits in the British Museum:—The head moderate; nose erect; nostrils in an oblong soft space; the upper beak with a simple short edge, rounded in front; lower beak with an acute produced centre. Alveolar surface of the upper jaw wide, linear, convex and rugose on the sides; alveolar surface of the front of the lower jaw broad, rugose, concave in the upper surface, narrow on the sides; feet broadly webbed, crenulated on the edges; toes rather weak, with a series of hexangular larger scales on the upper surface.

Skull in British Museum:—Beak white-spotted, edge entire; upper beak slightly bent down at the sides; alveolar process of upper jaw broad, flat, with a very slight central pit in front, and without any groove behind it; lower jaw slender but strong, bent up at the tip in front; alveolar process of lower jaw broad, concave, with a sharp outer margin in front.

This animal has the feet of *Batagur*; but the cavity of the skull is not contracted at the ends as in that group.

3. Damonia? crassiceps.

Shell oblong, rather expanded behind, depressed, with a

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rather interrupted central keel; vertebral shields broad, six-sided, blackish brown; discal shields with a darker posterior areola; margin entire, with a broad caudal notch; underside reddish brown, with a dark areola; sides of the sternum and underside of the margin blackish; the anterior marginal plates with several narrow pale rays, and the hinder ones with a broad central triangular ray; head very large, acute in front; eye lateral, pupil circular, black-brown above; underside of nose, chin, and throat, and underside of limbs and anal region, reddish; throat with four blackish streaks; front side of legs blackish, with small scales, and a few small transverse oblong plates. Toes 5.4, with transverse shields above, and united to the claws; claws acute. Tail moderate, tapering.

Hab. China (*Reeves*). This is only described from a free drawing, sent from China by Mr. Reeves, in Mr. Hardwicke's collection in the British Museum (Nos. 19–21). Named *Emys megacephala*, Gray's manuscript. Differs from *Damonia megacephala* in not having the markings on the side of the head.

4. Damonia nigricans. B.M.

Emys nigricans, *Gray, Cat. Shield Rept.* 20, t. 6.
Damonia nigricans, *Gray, P. Z. S.* 1869, p. 195.

Hab. China.

Skull (as seen through the skin of the stuffed specimen) oblong triangular, sides of face flattish; orbit lateral, rather large; crown nearly flat, with an arched hinder edge, which is about as far behind the hinder edge of the orbits as that part is from the end of the nose; zygomatic arch flat, as wide in front as the back edge of the orbit, and as the front edge of the tympanic cavity behind; the sheath of the upper jaw rather notched at the tip, with a simple edge; lower jaw broad, convex, and covered with a broad horny sheath in front; toes slender, webbed to the claws.

5. Damonia Reevesii. B.M.

Emys Reevesii, *Gray, Syn. Rept.* 73.
Geoclemmys Reevesii, *Gray, Cat. Shield Rept.* 18, tab. v.
Damonia Reevesii, *Gray, P. Z. S.* 1869, p. 194.

Hab. China.

Skull (as seen through the skin in the stuffed specimen) small, ovate trigonal; crown rhomboid, rather convex, produced in the centre behind, about as long from the back edge of the orbit as from the nose to that part of the skull; orbit rather large, lateral; zygomatic arch short, broad wider than the back of the orbit, and confluent with the crown above, not quite so wide as the front edge of the tympanic cavity behind. Sheath of the upper jaw simple, without any central hook. Lower jaw strong, convex in front, and with a convex horny sheath. Toes enclosed in the skin nearly to the claws, covered above with band-like shields.

An adult specimen in spirit, obtained from Mr. Blyth, most probably from India, but received without any habitat. Head large, strong; crown flat and short, not so long as wide; nose high, rather shelving to the mouth; eyes lateral; cheek flat; temple and zygomatic process convex. Upper beak very large and thick, with a straight edge without any central notch; the lower curved and acute in front, convex beneath. The alveolar processes very broad; upper rather convex and rugose; lower rather concave and broad the whole length of the side of the jaw. Neck and feet lead-coloured, without any streak. The thorax solid, thick, oblong, with three very obscure keels, the central one broad, and the lateral ones narrower, about one-fourth of the width of the shield from the upper edge. The back dull olive, the chest black, the underside of the margin pale yellowish. Toes strong, united in the skin to the claws, with a few shields above; claws acute, black. Tail moderate, conical, tapering at the end. The first vertebral plate rather longer than wide, narrowed behind, with a concave hinder edge; the second, third, and fourth vertebrals as wide as long, with a rounded front and an arched hinder edge, the second and third wider behind than in front, and the fourth wider in front than behind.

This specimen chiefly differs from typical *D. Reevesii* in the larger size, the larger head, and a difference in the form of the dorsal shield; but all this may depend on age and nourishment, and what were considered adult *D. Reevesii* may have been young animals.

3. ERYMA.

Head very short, broad, high in front; crown covered with a hard thin skin. Eyes lateral. Beaks high, short; upper slightly denticulated in front. Lower jaw very strong, curved up in front. Alveolar surfaces of the jaws very broad; of the upper jaw slightly convex, separated from each other by a wide longitudinal groove; of the lower jaw smooth and concave. Thorax solid, not keeled. Nuchal plate distinct. First vertebral plate very broad, transverse, as wide as the first two marginal plates; the second, third, and fourth vertebral plates nearly square. Toes very short, united by a web. Claws very strong.—Africa.

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1. Eryma laticeps. B.M.

Emys laticeps, *Gray, Cat. Sh. Rept.* 23, t. 9.

Hab. West Africa, Gambia; North Africa, Algiers, in Lake Tetzura.

Three specimens in spirits: two of them are uniform pale yellow below; one has a large irregular-shaped black spot or blotch on the outer side of the pectoral and abdominal plates.

Head oblong, rhombic, broad, nearly as wide as the length of the crown; sides of face high, erect. Beaks strong; side edges of the upper straight, with an acute notch in front; lower strong, rather convex below in front, with a sharp-edged broad tip above. Eyes large, subsuperior; temple behind orbit wide, bony; zygomatic arch strong, short, broad.

This species differs entirely from *Emys Tristrami* (p. 36) in the greater shortness and thickness of the head, in the strength of the beaks, in the neck and feet being entirely destitute of any appearance of yellow lines, and in the greater breadth of the alveolar surfaces; the shell differs in the greater width of the marginal plates, and also of the vertebral plates.

4. GRAPTEMYS.

Head covered with a thin hard skin. Eyes lateral, with a small horizontal band extending through the pupil. Alveolar surfaces of the upper jaw very broad, flat, separated in front by a wide central groove; lower jaw very broad, slightly concave, with a sharp external edge, and slightly bent up in front. Chin slightly convex. Claws 5.4; the front short, the first and fourth on the hind feet short, and the second and third very long, straight. Thorax tuberculately keeled, with pale netted lines. But see distribution of colour in 'Catalogue of Shield Reptiles,' p. 29, §§.

Graptemys, *Agassiz, Contrib.* i. 436 (1857).
Gray, Ann. & Mag. N. H. 1863, xii. 180.
Emys, sect. **§§, *Gray, Cat. Shield Rept.* 29 (1855).

1. Graptemys pseudogeographica. B.M.

Graptemys pseudogeographica, *Gray, Ann. & Mag. N. H.* 1863, xii. 180.
Emys pseudogeographica, *Gray, Cat. Sh. Rept.* 29.
Duméril, Arch. du Mus. vi. 223.
Holbrook, t. 15.
G. Lesueurii, *Agassiz, Cont.* 436, t. 2. f. 10, 12.

"Head small; eyes moderately large; iris rich golden colour, with a small horizontal black band not extending completely through it."—*Holbrook*, 104.

2. Graptemys geographica. B.M.

Graptemys geographica, *Agassiz, Contrib.* 436, t. 2. f. 7, 9.
Emys geographica, *Gray, Cat. Sh. Rept.* 29; *Ann. & Mag. N. H.* 1863, xii. 180.

"Eyes large, placed near the snout; iris golden in figure, with a narrow transverse band."—*Holbrook*, 100, t. 14.

Fam. IV. PSEUDEMYDÆ.

Head covered with a soft skin. Nose truncated. Temporal muscles covered with skin. Zygomatic arch distinct. Eyes lateral; iris with a spot on each side of the pupil, forming with it a black cross band. Sternum united to the thorax by a solid bony symphysis, with twelve shields. Toes short and strong, united to the claws by another web; claws strong. Alveolar surfaces of the jaws very broad, the upper with a central ridge separated in front by a longitudinal groove in the upper jaw, and continued into a central longitudinal groove in the lower jaw.

Synopsis of the Genera.

* *Jaws toothed; chin flattened below.*

1. **Pseudemys.**

** *Jaws nearly entire; chin convex, swollen.*

2. **Trachemys.** An eyed spot on the suture of the costal plates.
3. **Callichelys.** An eyed spot on the upper hinder part of each costal plate.

1. PSEUDEMYS.

Head convex, with a thin hard skin, ovate; forehead convex. Eyes superior; iris with a square spot on each side. Chin flat. Branches of the lower jaw dilated, flat, covered with a soft skin. Toes webbed. Eye with a dark spot on each side of the pupil, forming a cross band.

Pseudemys, *Gray, Proc. Zool. Soc.* 1855, p. 197; *Cat. Sh. Rept.* 35 (1855); *Ann. & Mag. N. H.* 1863, xii. 182.
Ptychemys, *Agassiz, Contrib.* i. 431 (1857).
Nectemys, *Agassiz, Contrib.* ii. 642 (1857).

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The throat of *Emys rubriventris*, t. 6, *E. floridana*, t. 8, *E. mobilensis*, t. 9, *E. pseudogeographica*, t. 15, *E. oregonensis*, t. 16, and others, with two yellow double lines united by a longitudinal line on the middle of the gullet; the upper line edging the lower jaw, and the other (narrower) on the middle of the throat, the latter sometimes having a more obscure central streak.

* *Two teeth in the upper and three in the lower beak.*

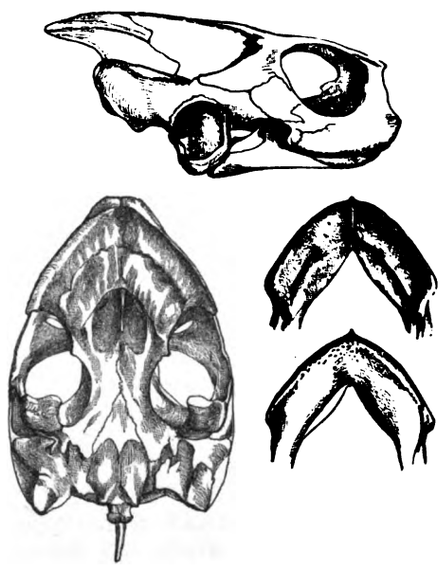
1. Pseudemys serrata.

Pseudemys serrata, *Gray, Cat. Shield Rept.* 34; *Ann. & Mag. N. H.* xii. 182.
Ptychemys rugosa, *Agassiz, Contrib.* 431, t. 26. f. 1, 11, t. 27. f. 1–3.
C. rubriventris, *Holbrook*, t. 6.
Emys rivulata, *Gray, Cat.* t. 11 (vide *Agassiz*).

Hab. N. America; running water with rocky beds.

"Lives in ponds and pools of stagnant water, in the neighbourhood of which they hibernate. They bask on the

Fig. 16.



Pseudemys serrata.

edges of the ponds or on fallen trees during the day, eating small reptiles, and they will suck *purslain* and other succulent vegetables."—*Holbrook*, 42.

Costal shields with separate rings or spots on each shield, some of the spots being under the suture and common to two shields; the costal of the very young with a subcentral, erect, pale line which is forked above, separating the centres of the rings; vertebral plates with three series of oblong ringed spots, the vertebral series being separated from the lateral ones by a continuous pale line on each side; jaws strong, the upper so deeply emarginate as to present the appearance of having two teeth, the lower serrated on the sides and has three teeth in front, of which the middle or hook is most prominent. Eyes large and prominent; iris with a black longitudinal band."—*Holbrook*, 56.

A mounted skeleton in the British Museum, from North America:—Skull solid, crown flat, produced and narrow behind; nose broad, square, high in front, shelving to the mouth below: the labial edge nearly straight, with a notch in front, and minutely denticulated on the margin. The zygomatic arch very broad, slightly convex externally; the mastoid bone produced horizontally, flat above externally, and keeled above, with a moderate-sized internal cavity; palate concave behind the internal nostrils; the alveolar surface of the upper jaw flat, wide, rather produced behind between the labial edges; inner or palatine edge simple, and armed in front with a large tooth on each side of the centre, which is produced into a longitudinal sharp-edged irregular ridge parallel to the outer margin and nearer to it than to the inner edge of the alveolar surface; the lower jaw strong, much depressed and wide in front, and quite flat on the lower surface; the alveolar surface broad, expanded, nearly as broad behind as in front, the centre of the outer edge produced and acute, with a large concavity on each side behind it, and with an irregular sharp-edged ridge nearer the inner edge than the outer margin, with a conical compressed prominence in front; the labial margin with a series of conical teeth.

A second skull is depressed, ovate, sides of the face shelving; nasal aperture very large; orbits very large, superior, separated by a very narrow space; crown rhombic produced behind; zygomatic arch very broad, convex, nearly as wide as the back edge of the orbit and the front edge of the oval tympanic cavity. Upper jaw with a well-marked irregularly dentated ridge parallel with the outer edge, and a broad flat space behind it; there is a conical tooth on the front end of the ridge, and a deep conical pit on the front of the upper jaw; internal nasal opening arched in front, near the middle of the palate; the lower jaw strong, broad, expanded; lower surface flat; upper surface with a short

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denticulated marginal edge, and a conical central prominence in front, with a central longitudinal ridge and a stronger arched ridge parallel with the outer margin. Toes long, slender, broadly webbed.

2. Pseudemys hieroglyphica.

Pseudemys hieroglyphica, *Gray, Cat. Shield Rept.* 34; *Ann. & Mag. N. H.* xii. 182.
Emys hieroglyphica, *Holbrook, Reptiles*, t. 17.
Duméril, Arch. du Mus. vi. p. 229.

Hab. N. America.

"Eyes large; iris golden" (in the figure, with a black band).—*Holbrook*, 112, t. 17.

3. Pseudemys labyrinthica.

Emys labyrinthica, *Holbrook*, t. .
Duméril, Arch. du Mus. vi. p. 229.

Hab. N. America.

4. Pseudemys ventricosa. B.M.

Emys ventricosa, *Gray, Cat. Sh. Rept.* 28, t. xiv.
Pseudemys mobilensis, *Gray, Ann. & Mag. N. H.* xii. 182.
Ptychemys mobilensis, *Agassiz, Contrib.* 433, t. 3. f. 14, 16.
E. mobilensis, *Holbrook*, t. 9?
Duméril, Arch. du Mus. vi. 228.

Hab. N. America.

"Eyes of moderate size; the iris reticulated with black and yellow lines [in the figure there is a black band], oval."—*Holbrook*, 72, t. 9.

** *Edges of beaks entire.*

5. Pseudemys concinna. B.M.

Pseudemys concinna, *Gray, Cat. Sh. Rept.* 34; *Ann. & Mag. N. H.* xii. 182.
Ptychemys concinna, *Agassiz, Contrib.* i. 432, t. 1. f. 13, t. 2. f. 4–6 (adult).
Emys floridana, *Holbrook*, t. 8 (vide *Agassiz*).

Hab. Florida.

"Eyes yellow, with a broad black stripe through the middle."—*Holb.* 120.

6. Pseudemys decussata.

Pseudemys decussata, *Gray, Ann. & Mag. N. H.* xii. p. 183.
Emys decussata, *Bell, Test.* t. 1.
Gray, Cat. Sh. Rept. 20.
Ptychemys decussata, *Agassiz, Contrib.* i. 431.

Skull in British Museum (figured Cat. Sh. Rept. t. 36. f. 2). The internal nostrils subanterior, between the converging alveolar plates; lower jaw with a short groove.

Gundlach says *Emys decussata* is the female of *Emys rugosa* (Fis.-Nat. de Cuba, ii. 104).

I am by no means satisfied that the species referred to this genus are well determined, that the extent of the notching and dentation of the beak is a character of the importance that is attached to it, or that when the patterns of the coloration and the changes that each presents have been more carefully studied, they will not afford better characters than those now used. The nuchal shield, as in *Callichelys*, is often marked with a central streak.

2. TRACHEMYS.

Trachemys, *Agassiz, Contrib.* 434 (1857).
Emys, sect. *§§, *Gray, Cat. Sh. Rept.* 25 (1855); *Ann. & Mag. N. H.* 1863, xii. 180.

1. Trachemys Holbrookii.

Trachemys Holbrookii, *Gray, Ann. & Mag. N. H.* xii. p. 181.
Emys Holbrookii, *Gray, Cat. Sh. Rept.* 25, t. 15. f. 1 (young).
E. cumberlandensis, *Holbrook*, t. 18.
Duméril, Arch. d. Mus. vi. p. 226.
E. sanguinolenta, *Gray, Cat. Sh. Rept.* t. 15. f. 1?
Trachemys elegans, *Agassiz, Contrib.* i. 435, t. 3. f. 9–11.
Emys elegans, *Neuwied.*

Skeleton (in separate bones) in the British Museum, prepared by Dr. Günther. Skull ovate, solid, crown quite flat, sides of face shelving outwards; nose rather produced beyond the mouth; orbit very large, lateral, subsuperior, upper hinder edge narrow; zygomatic arch very broad, convex; tympanic cavity subcircular. The edge of the jaws swollen, convex, labial edge rather arched, entire in front. The palate flat; internal nostrils large, subanterior, with an elongated broad slight concavity behind them. The alveolar surface broad, divided just over the internal nostrils by a large, thick central ridge parallel with the outer side, having a broad space on each side of it. Lower jaw strong, rather short, front and sides convex and rounded beneath; alveolar surface broad, with the short outer edge of an irregular narrow subcentral ridge parallel with the outer margin.

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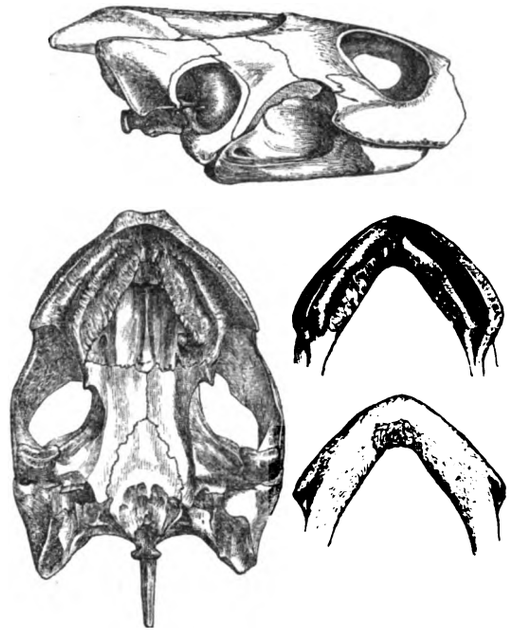
"Iris pale golden, with a black spot before and behind the pupil."—*Holb.* 116.

Fig. 17.



Trachemys Holbrookii.

2. Trachemys scripta.

Trachemys scripta, *Gray, Ann. & Mag. N. H.* 1863, xii. 181.
Emys scripta, *Gray, Cat. Sh. Rept.* 36.
E. serrata, *Holbrook*, t. 5.
Trachemys scaber, *Agassiz, Contrib.* i. 434, t. 2. f. 13-15 (young).

Hab. N. America.

"Eyes large; iris golden, with a broad black stripe extending horizontally through it; pupil black."—*Holb.* 50.

3. Trachemys Troostii.

Trachemys Troostii, *Agassiz, Contrib.* 435.
Gray, Ann. & Mag. N. H. xii. 181.
Emys Troostii, *Gray, Cat. Sh. Rept.* 28.
Holbrook, 1, t. 20.

Hab. N. America.

"Iris dark grey, with very narrow golden border surrounding the pupil."—*Holb.* 124.

Alveolar plates with a subcentral ridge in the upper jaw and a deep groove in the lower jaw; the front marginal plates convex, irregularly produced on the edge; the front claws slender, and the three middle ones rather longer than the rest; first vertebral plate urn-shaped.

4. Trachemys rugosa.

Trachemys rugosa, *Agassiz, Contrib.* 436.
Gray, Ann. & Mag. N. H. xii. 181.
Emys rugosa, *Gray, Cat. Sh. Rept.* 31.
Shaw, Zool. iii. t. 4.
Var. ? E. vermiculata, *Gray, Cat. Sh. Rept.* t. 12 *d.*

Hab. Cuba.

See Emys jamao, *Vilaro, Repert. Fis.-Nat. de Cuba*, ii. 104, 110, 119, 228.

3. CALLICHELYS.

Callichelys, *Gray, Ann. & Mag. N. H.* 1863, xii. 176.
Emys, sect. *§, *Gray, Cat. Sh. Rept.* 24 (1855).

Alveolar surfaces of both jaws broad; the upper with a narrow central ridge, and the inner edge raised and dentated, the ridges separated by a broad groove; of the lower jaw dentated on the edge and each with a slightly raised subcentral ridge, which are united on the front edge by a longitudinal central ridge.

Agassiz regards all these species as varieties of *Emys concinna*; but he has not seen the specimens on which they are founded; and he also considers *E. annulifera* a variety of the same species.

1. Callichelys ornata.

Callichelys ornata, *Gray, Ann. & Mag. N. H.* 1863, p. 176.
Emys ornata, *Gray, Cat. Sh. Rept.* p. 24, t. 12.
E. concinna, var., *Agassiz.*

Vertebral plates with a single spot on the vertebral line, surrounded by pale rings which often throw out branches to the margins. Costal plates with a subcentral dark-eyed spot, surrounded by dark rings and a broad pale ring; first and second with one or two processes to the lower edge. Vertebral shields with a dark spot on the hinder central edge, which on the second, third, fourth, and fifth are surrounded by a series of narrow rings having a broad arched pale band on each side (near middle of side), the first with a central pale streak and parallel pale line, and two broad pale arches like the

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other; hinder with a subcentral pale spot, surrounded by some dark rings. The fore leg with two streaks; upper continued on to the second toe; lower broad, not continued; toes each with a streak; costal with an oblong subcentral rather posterior spot, surrounded by a pale ring, and some other more indistinct ones, complete below. Without any vertebral streak; but each vertebral shield with a central polygonal ring, which on the second, third, and fourth gives out side branches.

A smaller specimen:—Like the former, the spot on costal round, lower down; rings incomplete below; vertebral shield with a narrow pale oblong ring round the keel of each plate, and with branched irregular lateral lines; costal with a black spot near lower part of hinder margin and a single incomplete yellow ring; vertebral plates with an interrupted pale line and a dark spot on the hinder part, with an arched longitudinal pale line on each side, the arched line on the third shield sending out lateral branches from an incomplete polygonal ring; head with many thin lines; one central on sternum, but narrow, linear, not broad, clavate; beak convex below, yellow-lined.

2. Callichelys venusta. B.M.

Callichelys venusta, *Gray, Ann. & Mag. N. H.* 1863, xii. p. 181.
Emys venusta, *Gray, Cat. Sh. Rept.* 24, t. 12 A.
E. concinna, var., *Agassiz.*

Hab. Guatemala (*Salvin*).

Young. Costal plates with a black spot surrounded by a broad circular orange ring edged with black; vertebral plates with orange curved streaks on each side, in fact they form an oblong and central keel.

3. Callichelys callirostris. B.M.

Callichelys callirostris, *Gray, Ann. & Mag. N. H.* 1863, xii. p. 181.
Emys callirostris, *Gray, Cat. Sh. Rept.* 25, t. 12 B.
E. concinna, var., *Agassiz.*

4. Callichelys? pulcherrima. B.M.

Callichelys? pulcherrima?, *Gray, Ann. & Mag. N. H.* 1863, xii. p. 181 (very young).
Emys pulcherrima, *Gray, Cat. Sh. Rept.* 25, t. 25. f. 1, 2.
E. oculifera, *Gray, Cat. Sh. Rept.* p. 23?

Toes united by a very narrow web.

Hab. South Africa (Mus. Berlin). A very doubtful species.

5. Callichelys Grayii.

Emys Grayii, *Bocourt, Ann. Sci. Nat.* 1868, x. 621.

Fam. V. DERMATEMYDÆ.

The head moderate, rather high, covered with a thin, soft, continuous skin. Temples with small polygonal shields. Zygomatic arch distinct. Tympanum large, covered with a granular skin. Eyes lateral; iris circular, narrow. Nose produced, conical; nostrils apical, flesh-coloured. Beak strong. Upper beak coloured like the skin of the head, hard; lower beak strong, hooked in front. Alveolar surface of the upper jaw with a triangular ridge parallel to the outer edge of the jaw, and with a short separate transverse ridge notched in the middle in front, separated from the front of the beak by a deep pit. Lower jaw with three or five strong teeth in front, which fit into the pit in front of the upper jaw. The alveolar surface flat, with a subcentral groove along each side. Chin not bearded. Thorax oblong, the hinder edge expanded slightly and reflexed, covered with very thin membranaceous shields which have the areola in the young animal on the hinder margin. Sternum flat, united to the margin by a bony symphysis, rounded in front and notched behind. Sternal shields twelve, very thin, membranaceous. The gular plates small, triangular, sometimes united into a single plate, with three additional intramarginal plates on the sutures, between the triangular axillary and the band-like inguinal plates, between the ends of the abdominal and marginal plates. The cavity of the shell scarcely contracted at the opening. The legs short, thick, fringed on the outer side, granular. Toes weak, broadly webbed. Tail short, thick, angular, with ridges of spines and a horny tip.

Dermatemydæ, *Gray, P. Z. S.* 1870 (ined.).

Synopsis of the Genera.

1. **Dermatemys.** Crown flat. Vertebral shields elongate; the first shortest. The gular plates separate or united.
2. **Chloremys.** Crown convex. Dorsal shields wider than long. The gular plates united.
3. **Pleurosternon.** Vertebral shields broad. No nuchal shield.
4. **Wincania.** Vertebral plates oblong, much broader than long. Nuchal plate distinct.
5. **Palemys.**

1. DERMATEMYS.

Head flat above, rather keeled on the sides. The crown narrow and produced behind. Temples with small polygonal shields. Thorax convex. Nuchal shield distinct, short. First vertebral plate as broad as long; second,

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third, and fourth longer than broad; the fifth narrow and produced in front, broad behind. Gular plates small, separate or united together into one plate. Intramarginal plates three on each side; the hinder in contact with the abdominal and femoral plates. Abdominal plate long. Axillary plate distinct. Tail conical, with a central ridge of spines on its upper surface, and some scattered tubercles on the sides converging towards the point.

Dermatemys, *Gray, Cat. Shield Rept.* 49; *P. Z. S.* 1870 (ined.).

1. Dermatemys Mawii. B.M.

Gular plates very small, separate.

Dermatemys Mawii, *Gray, P. Z. S.* 1847, p. 56; *Cat. Sh. Rept.* 49, t. 21.
Dermatemys Mavei, *Cope, Proc. Acad. Nat. Sci. Philad.* 1868, p. 120.

Hab. South America (*Mawe*).

2. Dermatemys Salvinii. B.M.

The gular plates united into a single narrow triangular plate; sides of the head and neck and upper surface of the feet olive, darker-spotted, in spirit.

Dermatemys, *Gray, P. Z. S.* 1864, p. 126 (animal).

Hab. Guatemala (*Salvin*).

3. Dermatemys Berardi.

Dermatemys Berardi, *Cope, Proc. Acad. Nat. Sci. Philad.* 1868, p. 120.

Described as having "one gular, and one intergular plate behind it."

If this is not a deformity, it would rather indicate a species of *Hydraspidæ*. It can scarcely be M. A. Duméril's species described as *Emys Berardii* from "Vera Cruz, Mexico."

2. CHLOREMYS.

Head rather convex above. Thorax rather depressed, broad. Nuchal shield distinct and short. Vertebral plates keeled; the first as broad as long; the second, third, and fourth broader than long; the fifth rather narrowed in front. The gular plates small, united into one narrow triangular shield. The intramarginal plates three on each side, the hinder largest and not or only slightly in contact with the femoral plate. Axillary plate triangular. Inguinal band-like, transverse. Tail conical, very short, granular.

The intramarginal plates are sometimes divided in half on both sides.

Chloremys, *Gray, P. Z. S.* 1870 (ined.).

1. Chloremys abnormis.

Animal and shell olive above, white below; upper part and sides of the head and neck blackish olive, with a pale streak from the back of the eye over the ear along the side of the neck.

Dermatemys abnormis, *Cope, Trans. Acad. Nat. Sc. Philad.* 1868, p. 120.
Chloremys abnormis, *Gray, P. Z. S.* 1870, t. (ined.).

Hab. Yucatan, Belize (*Dr. Parsons, Cope*); Laguna de Tormina, east coast of Mexico.

3. PLEUROSTERNON.

Shell depressed, broad. Sternum entire, with a series of submarginal scales in the sternocostal suture. Vertebral shields very broad, and nuchal shield none; vertebral plates hexangular.

Pleurosternon, *Owen, Mon. Foss. Chelon. Weald. Clay*, 2, 1853.

1. Pleurosternon concinnum.

Pleurosternon concinnum, *Owen, l. c.* t. ii. & iii.

2. Pleurosternon marginatum.

Pleurosternon marginatum, *Owen, l. c.* 6, t. iv.–vi.

3. Pleurosternon ovatum.

Pleurosternon ovatum, *Owen, l. c.* 8, t. vii.

4. WINCANIA.

Like *Pleurosternon*, but with a distinct nuchal plate, and the vertebral plates oblong, much broader than long; second, third, and fourth very broad.

1. Wincania latiscutata.

Pleurosternon latiscutatum, *Foss. Purbeck Limestone.*

5. PALEMYS.

Sternum broad, united to the thorax by a bony symphysis, with a subtrigonal plate on each side of the outer end of the suture between the pectoral and abdominal shields. Vertebral shields hexangular, the third very broad, the fifth narrower.

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1. Palemys lævis.

Emys lævis, *Bell, Foss. Chelon. London Clay*, 70, t. xxii.

Hab. Sheppey (fossil).

Fam. VI. BATAGURIDÆ.

Head rather large, covered with a soft skin divided into small plates. Nose rather produced. Angle of the mouth covered with small scales. The temporal muscle protected by a soft skin and a distinct zygomatic arch. Eyes lateral and superior; iris of the eye without any spot on the sides of the pupil. Sternum attached to the thorax by a bony symphysis, solid, and covered by twelve shields. Toes elongate, slender, united by a broad web. Hind feet fringed. Claws weak. The alveolar surfaces of the upper and lower jaws very broad, with one or two angular ridges parallel to the jaw. Cavity of the thorax contracted at each end by a broad internal bony plate on each of its sides.

Batagurina, *Gray, P. Z. S.* 1869, pp. 185 & 200.

"The Batagurs are essentially herbivorous; eggs white, cylindrical, deposited in sand banks near the top of the tide-way."—*Theobald.*

Batagur baska, essentially herbivorous, used for making turtle-soup in Calcutta. They are kept alive in tanks for the market.—*Theobald.*

"*Batagur Berdmorei*, extensively eaten in Pegu."—*Theobald.*

Synopsis of the Genera.

Section I. *Claws* 4 . 4. *Nose produced. Alveolar surfaces of the upper jaw with two ridges, and a central longitudinal ridge between them in front, and of the lower jaw with two grooves. Fourth vertebral shield hexangular, broad. Cavity of the shell much contracted before and behind.* Batagurina.

1. **Batagur.** Nuchal plate distinct.

2. **Callagur.** Nuchal plate none.

Section II. *Claws* 5 . 4. *Nose slightly produced. Alveolar surfaces of the upper jaw with one straight angular ridge, and a central longitudinal ridge between them in front; of the lower jaw with one groove, separated by a central longitudinal groove in front. The fourth vertebral shield hexangular, broader behind, truncated before and behind. Cavity of the shell much contracted before and behind.* Kachugina.

3. **Kachuga.** Nuchal plate distinct. First vertebral shield nearly square, about as long as broad. The edge of the jaws even.

4. **Dhongoka.** Nuchal plate distinct. First vertebral shield elongate, generally contracted in the front of the sides. The edge of the jaws even.

5. **Hardella.** First vertebral plate elongate; the fourth vertebral plate hexangular, with nearly equal sides. The edge of the lower jaw strongly dentated.

6. **Cantorella.** Nuchal plate none.

Section III. *Claws* 5 . 4. *Nose truncated. Alveolar surfaces of the upper jaw with one straight angular ridge, separated in front by a central longitudinal groove, without any longitudinal ridge. Lower jaw with one angular groove, continued in a central ridge in front. The fourth vertebral shield elongate, very narrow and produced in front, broad behind, acute at both ends. Cavity of the shell contracted before and behind.* Pangshurina.

7. **Pangshura.** Shell high. The third vertebral plate tapering behind. The first vertebral plate broad in front, narrow behind.

8. **Cuchoa.** Shell high. The third vertebral plate tapering behind, the first square, truncated before and behind.

9. **Jerdonella.** Shell high, strongly serrated behind. First vertebral plate nearly square; second broad, hexangular; third elongate, very sharply keeled.

10. **Emia.** Shell depressed, oblong. The third vertebral plate quadrangular, truncated behind. Cavity of the shell scarcely contracted.

Section IV. *Claws* 5 . 4. *Nose truncated. Alveolar surface of the upper jaw with one angular ridge suddenly bent outward in front, and one groove in the lower jaw. The fourth vertebral plate hexangular, broad. Cavity of the shell not contracted.* Moreniina.

11. **Morenia.**

Section I. *Claws* 4 . 4. *Nose produced. Alveolar surface of the upper jaw with two ridges, of lower jaw with two grooves. Fourth vertebral shield hexangular, broader than long; the second and third longer, the third the largest; the first nearly square. The cavity of the shell much contracted before and behind. Ridges of the alveolar processes with a longitudinal ridge between them in front. The ridges of the lower jaw separated by a central sharp-edged rhombic longitudinal groove.* Batagurina.

1. BATAGUR.

Nuchal shield distinct. Claws 4 . 4. Head covered with a soft skin which is divided into small shields on the crown and temple. Nose conical, produced. The chin with a series of distinct shields at the under edge of the beak.

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The alveolar surface of the jaws very wide, with two well-marked subparallel ridges. Gular shield short, band-like.

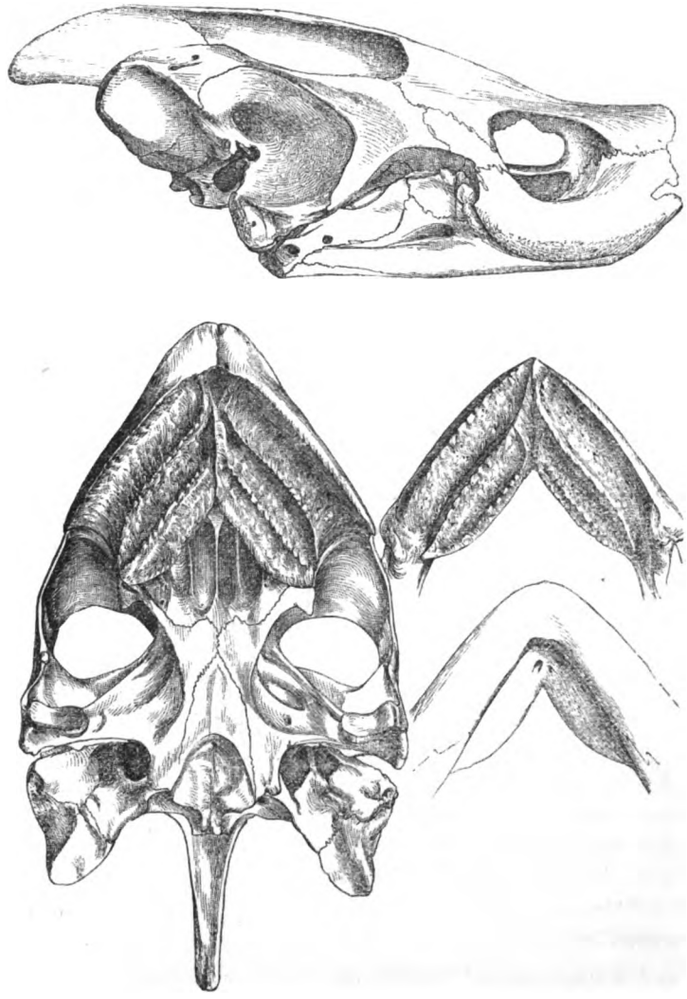
Cavity of the shell very much contracted in front and behind. The upright bands each occupying one quarter of the opening.

Batagur, *Gray*, *Cat. Sh. Rept.* 35.
Tetraonyx, *Gray*, *P. Z. S.* 1869, pp. 186, 200.

1. Batagur baska. B.M.

Batagur baska, *Gray*, *Cat. Sh. Rep.* 35, t. 16; *Ann. & Mag. N. H.* 1857, xix. p. 243.
Blyth, *Journ. As. Soc.* xl. 1863, p. 77.
Tetraonyx Lessoni, *Theobald*, *Journ. Linn. Soc.* x. 1868, p. 17.
Tetraonyx baska, *Gray*, *P. Z. S.* 1869, p. 199, fig. 11.

Fig. 18.



Batagur baska. Two-thirds nat. size.

Hab. Lower Bengal, common; Pegu, Comara (*Theobald*); Irawaddy (*Blanford*); Pinang (*Cantor*).

Timid and herbivorous. Often used to make soup in Calcutta.

"There is a very large adult shell of this species, sent by Dr. Bleeker from Leyden, marked '*Emys tentoria*, Blyth.' It measures 21½ inches over the back, 19½ along the sternum, and is 18 inches across the back, and 21½ over the convexity of the back. The jaws of the species are very

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strongly dentated, the upper one is toothed on the edge, with two angular series of pits; the lower jaw is furnished with two concentric series of acute spinose tubercles, those in the outer series the largest and very acute, the central one in front horny, very large."—*P. Z. S.* 1856, p. 182.

Skull triangular; crown flat; upper beak with a high narrow marginal edge, and *three* concentric triangular ridges, the inner the smallest and the outer largest, separated by a central narrow longitudinal ridge; lower beak with three ridges, the inner very small, slightly raised, very rough; palate convex; nostrils with two sunken oblong grooves.

Head in spirits in the British Museum:—Triangular, depressed; crown flat, rhombic, covered with thin hard shields; the front one rhombic, extending to over the tympanic cavity and with two pairs of elongate occipital plates behind it, the outer pair being the longer. The temples, cheeks, and throat covered with small, flat shields. The upper beak high, rather flattened on each side and under the nostrils in front, separated from the front lateral edge of the frontal plate by a straight suture; nostrils in a small four-sided cartilaginous disk between the upper edge of the beak and the front edge of the frontal plate; upper jaw notched deeply and bidentate in front; lower jaw strong, convex in front.

Shell nearly adult:—Bluntly keeled in front; first vertebral plate rather broader than long, second and third hexagonal, as long as broad; the cavity of the shell very much contracted before and behind. The quite adult shell with the usual obscure keel in front of the vertebral line quite obliterated; lateral marginal plates rather broad; fourth lateral marginal plate pentangular.

This species grows to a large size. There are in the British Museum two specimens of the shell without the animal, very ventricose, black above and below, rather rugose, and with the suture between the shields nearly obliterated, which I believe to belong to this species. They were received from Dr. Faulkner, and probably came from Nepaul. One is 24 inches long, and 23 inches wide, measured over the back; the other is 23½ inches long and 24 wide, measured over the back. There is a smaller adult specimen of the shell from Pegu, collected by Mr. Theobald; it is 20 inches long and 19 broad, measured over the back.

There are two stuffed specimens, *a* and *b* of the 'Cat. of Shield Rept.' p. 35, from the Ganges, obtained from Mr. Blyth. The young specimens, which are nearly orbicular, are figured in my 'Indian Zoology,' from Dr. B. Hamilton's drawings, as *Emys baska* and *Emys batagur*. It is also figured as *Batagur basca* in Günther's R. B. I. t. 3. f. B.

Emys dentata (Gray's Syn. Rept. t. ix., and Illus. Ind. Zool., from Hardwicke's drawings, t.) is not the young of this species, but is the same as was afterwards described as *E. Ellioti*.

There is a very young specimen in the British Museum, received from Pinang, from Dr. Cantor, and named by him *Tetraonyx basca*, numbered 60. 319. 1450.

2. CALLAGUR.

Head elongate. Nose produced, conical. Alveolar surface not examined. Thorax oblong, rather depressed. Vertebral plates with a tubercle near the hinder edge, perhaps becoming obliterated in the older specimens; the first square, about as long as broad; the second, third, and fourth hexangular; the fourth broadish. Marginal plates square; the fourth and sixth like the rest. *Nuchal plate none.* Claws 4. 4.

1. Callagur picta. B.M.

Back pale olive, with three dark brown streaks, and a square dark brown spot on the front edge of each marginal plate; the underside whitish.

Batagur picta, *Gray, P. Z. S.* 1862, p. 264, t. ; *Ann. & Mag. N. H.* 1863, xii. p. 75.

Hab. Sarawak (*Wallace*).

Thorax pale grey-brown, with three interrupted dark brown streaks on the back, and a mere or less triangular dark brown spot on the front margin of the marginal shields; beneath uniform pale yellow; nuchal shield none; the first vertebral plate oblong, four-sided, rather longer than broad; the second, third, and fourth six-sided, second and third as long as broad, the fourth rather longer than broad; the margin entire, bent up behind; the pectoral and anal plates as long as broad; head (when dry) pale olive, blackish on each side.

Length 11, width 8½ inches. Not full-grown, and with large intercostal spaces on the sides, showing that this species grows to a much larger size.

Section II. *Claws* 5. 4. *Nose slightly produced. Alveolar surface of the upper jaw with one straight angular ridge on each side; of lower jaw with one groove. The ridges of the alveolar surface of the upper jaw are straight,*

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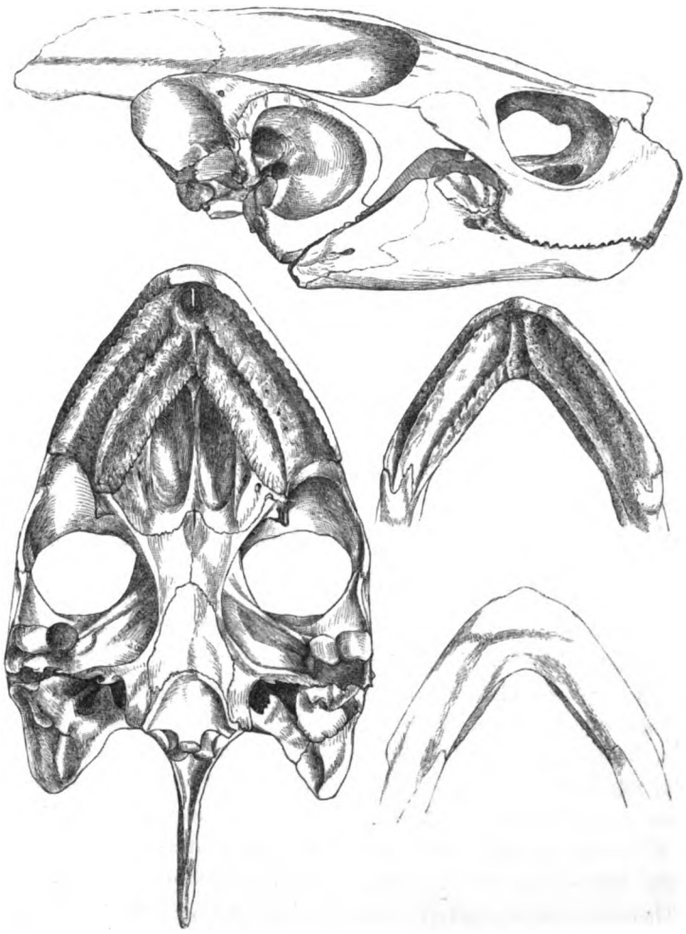
separated in front, with an acute longitudinal ridge in the centre between them, and the lower jaw with a triangular central longitudinal groove. The fourth vertebral shield hexangular, broader behind, truncated before and behind. Cavity of the shell much contracted before and behind. Kachugina.

The alveolar surface of the jaws very wide and well-developed, with a denticulated ridge parallel to the outer edge. The internal edge of the alveolar surface, which edges the internal nostrils, is denticulated; it must not be confounded with the second ridge in the genus *Batagur*.

Head covered with a thin skin. Gular shields triangular, moderate.

Kachuga, *Gray*, *P. Z. S.* 1869, pp. 186 and 201.
Batagur, *Gray*, *Cat. Sh. Rept.* 35; *P. Z. S.* 1869, p. 197.

Fig. 19.



Kachuga trilineata. Two-thirds nat. size.

3. KACHUGA.

Nuchal plate distinct. First vertebral shield nearly square, about as long as broad. The edge of the jaws even.

Kachuga, § Batagurella, *Gray*, *P. Z. S.* 1869, p. 200.

* *Hinder margin of shell entire.*

1. Kachuga trilineata. B.M.

Upper part of neck olive, without any stripes; hinder margin of the shell entire.

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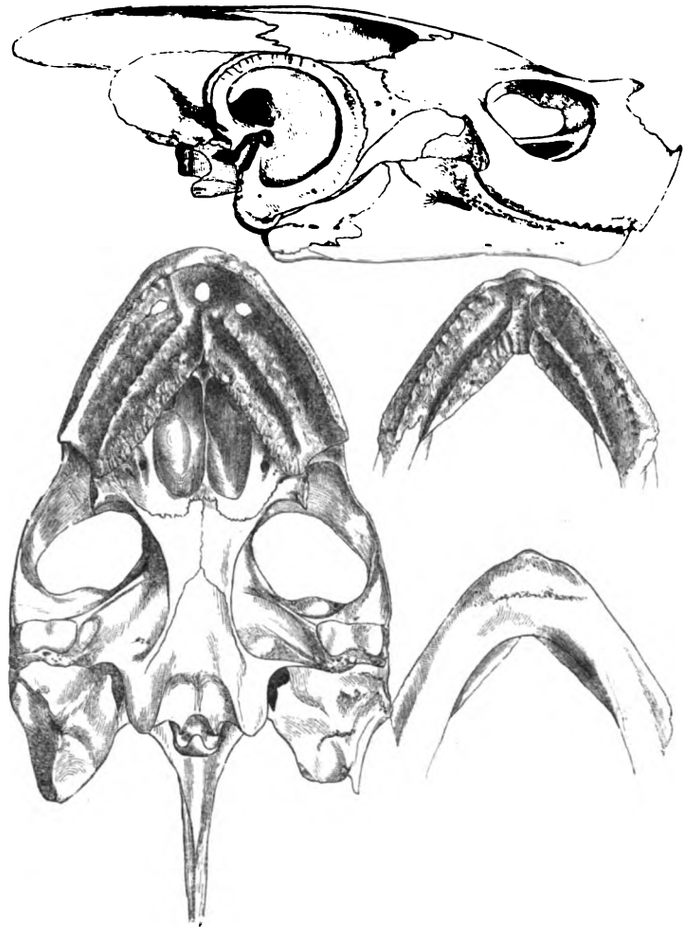
Batagur lineata, *Gray, Cat. Sh. Rep.* 35, t. 17 (half-grown).
Günther, R. B. I. 39; *P. Z. S.* 1861, p. 164.
B. trivittata, *Theobald, Journ. Linn. Soc.* vol. x. 14.
Kachuga trilineata, *Gray, P. Z. S.* 1869, p. 200, f. 13 (skull).

Hab. Nepal (*Boys*); Pegu, Maulmain rivers (*Theobald*).

Mr. Theobald describes the animal as pale yellow, the upperside of the limbs dusky, the neck yellow; the head covered with a vascular skin, which is deep flesh-colour when alive, but instantly fades on death to waxy white; forehead with an elongate lozenge-shaped plate. The males have three pitchy-black bands on the back of the

Fig. 20.



Kachuga peguensis. Two-thirds nat. size.

thorax; and the females, which are much larger, are all black. This species grows to a large size.

In the British Museum is the shell of a female obtained from Mr. Theobald, which is 22½ inches long and 20 inche broad over the back.

The female comes to the banks to deposit her eggs and is not taken by the fishermen. They are much larger and more ventricose and darker than the males. They are often used to make soup.

A skull in the British Museum, figured under the name of *Kachuga trilineata* (P. Z. S. 1869, p. 202, f. 13):—The upper jaw with a short, very distinct central longitudinal

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dentated ridge behind the deep conical pit in the front of the jaw, which commences between the ends of the secondary ridges. The lower jaw with a deep longitudinal groove in front behind the central conical prominence on the edge.

Palate narrow, concave, with a ridge on each side and two moderately deep concavities behind each internal nostril, each with a central longitudinal ridge. The ridges on the upper jaw short, and the anterior central ridge narrow and sharp-edged. The front part of the lower surface of the temporal bone, between the condyle and sphenoid, shelves upward, not forming a broad cavity. The inner surfaces of the front part of the lower jaw have a shelving plate for the support of the inner longitudinal ridge on the upper dental surface. The orbit regular, oblong, moderate, large.

There is a second skull in the British Museum, received without the rest of the animal, from Mr. Theobald, figured in the Proc. Zool. Soc. as *Kachuga peguensis*.

The upper jaw with a short very distinct central longitudinal dentated ridge behind the deep conical pit in the front of the jaw, which commences between the ends of the secondary ridges. The lower jaw with a deep longitudinal groove in front behind the central conical prominence on the edge.

Palate flat, with two very deep oblong concavities, one behind each of the internal nostrils. The ridges of the upper jaw are elongate, and the anterior central ridge is broad at the base, with a deep broad concavity on each side between the sphenoid and condyle. The inner surface of the front part of the lower jaw is erect, without any expanded plate.

The concavities behind the internal nasals as broad behind as in front; orbit large, irregular, oblong, nearly as high as long.

On reexamination, I am inclined to regard the difference between the skulls as merely sexual or individual; or it may be the skull of one of the species described in this catalogue.

There are three half-grown shells in the Museum, the largest from Mr. Theobald, and the smallest from Captain Boys, from Nepal, which is figured in 'Cat. Sh. Rept.' t. 17. They have each a tubercular keel on the hinder edge of the second and third vertebral plates; the lateral plates are all square, the fourth and sixth being like the rest. The largest is marked with three black streaks; but this colour appears to be laid on the shell, and flakes off. The other two are uniform olive without any streaks.

2. Kachuga fusca. B.M.

Shell brown; vertebral plates very indistinctly keeled behind; nuchal plate triangular, very broad behind; first and second vertebral plates nearly square; the third subhexangular, broader than long, the posterior sides shorter; the fourth elongate, subhexangular; hinder side short and rather narrowed behind, much longer than broad; beneath yellow. The rest of the animal is unknown.

Hab. India.

There are two specimens of this shell in the British Museum without animals.

3. Kachuga lineata.

Back of the neck pale brown, with seven red-brown streaks; hinder edge of shell entire.

Emys lineata (Gray's Syn. Rep. 23) was established on the drawings of a nearly adult animal of this genus in Hardwicke's collection in British Museum, which is of a uniform pale olive-colour. The crown of the head is brown, and the upper part of the neck is pale brown, with seven red-brown streaks; the sides of the face and temple are bluish, and the chin with two yellow spots on the sides.

The same species is evidently figured by Dr. Hamilton under the name of *Emys kachuga*; but the stripes on the sides of the neck are made brighter red-brown. A copy of his drawing is published in the first volume of Gray's 'Indian Zoology,' under that name.

"Pupil very small; iris circular, without any lateral spot."—*Hardw.*

** *Hinder margin of the shell deeply notched.*

4. Kachuga dentata. B.M.

Back of the neck with seven blue streaks; hinder margin of the shell strongly dentated at all ages.

Emys dentata, *Gray, Syn. Rep.* t. 9; *Illust. Ind. Zool.* 11, t. 2 (upper figure).
Batagur tentoria, specimens *b* & *c*, *Gray, Cat. Sh. Rept.* 37.
B. lineata, *d*, *Gray, Cat. Sh. Rept.* 36.
B. Ellioti, *Gray, P. Z. S.* 1862, p. 264; *Ann. & Mag. N. H.* 1863, xii. p. 75.
Günther, Rep. B. Ind. 44, t. iii. f. *a*, *a*.

Hab. India.

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Young.—Pale grey-brown, one-coloured when dry; the hinder margin strongly and acutely serrated; nuchal shield broad, short; second, third, and fourth vertebral shields strongly keeled and ending in an acute prominence; the first square, rather broader than long; second and third six-sided, broader than long; fourth six-sided, longer than broad. Underside uniform pale yellow; the gular plate triangular; the pectoral and anal shorter than broad; the head dusky brown; temple and beak yellow, with a blackish streak from the nostril to the orbit, and continued behind from the orbit over the tympanum.

Hab. Southern India, River Kistna (*Walter Elliot*).

The specimen is very young, with very large narrow intercostal spaces, showing that it grows to a considerable size. It is known from all the other species by its sharp dentated margin.

Nuchal plate broad, short; anterior marginal plate subtriangular, the rest square; hinder marginal plates strongly serrated; anterior vertebral plates sub-six-sided, about as broad as long; second and third vertebral plates acutely keeled behind, hexangular, much broader than long; fourth vertebral plate attenuated in front, elongate, hexangular, longer than broad.

Hardwicke figures the head and neck of the animal as brown, with five broad green stripes on the upperside. Dr. Günther's figure is from a specimen in the British Museum, which I described in the 'Proc. Zool. Soc.' as *B. Ellioti*.

There is a younger specimen in the Museum about half the size of the former, which has an indistinct tubercle on the upper hinder edge of each costal plate. Another, which was received from Capt. Boys's collection, is very much younger. These are the two specimens which Dr. Günther, in his 'Rept. B. India,' p. 34, says are probably the young of *Batagur Dhongoka*.

4. DHONGOKA.

Nuchal plate distinct. First vertebral shield elongate, generally contracted in the front part of the sides. The edge of the jaws slightly dentated on the margin.

Kachuga dhongoka, *Gray*, *P. Z. S.* 1869, p. 202.

1. Dhongoka Hardwickii. B.M.

Batagur dhongoka, *Gray*, *Cat. Sh. Rept.* p. 36, t. 18. f. 1 (skull).
Günther, *P. Z. S.* 1861, p. 214.

Emys dhongoka, *Gray & Hardwicke*, *Indian Zool.* t.
Blyth, *Journ. As. Soc.* xl. 77.
Kachuga Hardwickii, *Gray*, *P. Z. S.* 1869, p. 202.

Hab. Bay of Bengal, eastern side, common; and in the Nerbudda, an estuarine species; Nepal (*B. H. Hodgson, Esq.*); Pegu (*Theobald*).

It is not unfrequently brought to the Moulmain fish-bazaar.

Shell depressed; hinder margin slightly bent up; vertebral plates elongate, generally longer than broad; the first pentagonal, rather narrower in front, broad and truncated behind; the second rather urn-shaped, truncated in front, narrow and rather produced behind; the third subhexangular, about as broad as long, truncated behind; the fourth elongate, narrow and truncated before and behind, rather dilated behind the middle; the fifth elongate, narrow and truncated in front. Shields olive, with a dark spot on the upper part of the costal ones, and a dark keel on the vertebral plates, which becomes more obliterated as the animal becomes old. Cavity of the shell much contracted; the nuchal plate triangular, very broad behind; marginal plates square; fourth and sixth subpentagonal.

An adult shell from Nepal, very much like the preceding, has the first vertebral plate dilated in front; and the second has the hinder edge produced triangularly in front, making a triangular notch in the third.

Var.? A younger specimen, much darker, with three distinct black streaks; and the hinder part of the shell is very much depressed, and turned up on the margin.

Hardwicke figures an adult specimen with the thorax olive-brown, with three black streaks and a dark margin; the upper part of the head, neck, and feet dusky olive, with a white streak from the nostrils to the orbit continued in a narrow streak on the upper part of the temple to over the upper surface of the ears.

The same animal is figured in Dr. Hamilton's drawings under the name of *E. dhongoka*; and this drawing is published under this name in Gray's 'Illustrations of Indian Zoology,' vol. ii. I believe these figures are intended for this species; but the first vertebral plate is not represented as long as it ought to be in comparison with the others.

The upper shield of a very large animal, received from Dr. Faulkner, is characterized by the square form of the second, third, and fourth vertebrals, and the great width of the marginal shields. It is 21 inches long and 20 inches wide, measured over the convexity of the back. There is also the perfect shell and a very large animal of the same

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size from Moulmain in the museum; it is distinguished from a very large specimen in the museum, which I believe to be *K. lineata*, by the shell being more depressed.

A skull in the British Museum (figured under the name of *Kachuga dhongoka* in 'Cat. Sh. Rept.' t. xxxvi. f. 1), received with the name of *Dhongoka*, but without any other part of the animal, is believed to belong to this species, and is described as follows:—

"The upper jaw with a notch between the two divergent ridges, and an indistinct broad longitudinal ridge in the centre of the plates behind them. The lower jaw with a distinct sharp-edged short longitudinal central ridge just between the back edge of the conical marginal prominences and the middle of the diverging ridges, and a deep ovate longitudinal concavity behind the middle of those ridges: it has also a slightly shelving plate for the support of the diverging dental ridges. The palate narrow, rather concave, with a very deep oblong concavity behind each internal nostril. The orbit regular oblong, longer than high."

The edge of the jaws slightly dentated on the margin, without any of the large teeth found in *Hardella*.

5. HARDELLA.

Shell oblong. Nuchal plate distinct. Marginal plates square, even. First vertebral plate elongate, four-sided, rather narrow in front; second four-sided, as long as broad; third and fourth six-sided, lateral edges subequal; the fourth the largest. The hinder edge truncated, rather narrower in front. Head covered with a thin skin. Edge of the beaks very strongly dentated; the upper with a notch, with a tooth on each side of it; lower with a strong tooth in front. Claws 5.4.

The skull solid, with the alveolar process very wide; the upper jaw with a slightly elevated, narrow, dentated ridge, separated in front by a large deep pit, which has a sharp-edged longitudinal keel behind it. The lower jaw very strongly dentated on the edge. The internal ridge on each side short, narrow, the two separated by a central longitudinal groove. Figured as *Kachuga Oldhami*, P. Z. S. 1869, p. 200.

Emys, sp., *Gray*, *Cat. Sh. Rept.* 21.
Kachuga, sp., *Gray*, *P. Z. S.* 1869, p. 200.

1. Hardella Thurgi. (Fig. 21.) B.M.

Thorax black above and below.

The back of the young olive-black, with three darker streaks on the back.

Emys Thurgi, *Gray*, *Cat. Sh. Rept.* 21.
Günther, *Rept. B. Ind.* 24.
Kachuga Oldhami, *Gray*, *P. Z. S.* 1869, p. 200, fig. 14.

Hab. India.

By examining the head of the adult specimen in the British Museum I have been enabled to prove what I have long suspected, that *Thurgi* is a Bataguroid, and also to identify the skull which I figured as *Kachuga Oldhami* as the skull of this species.

Dr. Günther retains this species in the genus *Emys*, observing, "The structure of its jaws shows that it is a thoroughly carnivorous and probably a ferocious species;" but I believe that this is a mistake. The Tortoises and Turtles which have the broadest and most complicated chewing-surfaces of the jaw are herbivorous or algivorous.

"Pupil very small, circular, without any lateral spot."—*Hardwicke*.

2. Hardella Indi. B.M.

Thorax less obscurely three-keeled; dorsal shields thin, black; underside of the marginal shields and sternum yellow, with blackish blotches on the hinder part of each shield.

Hab. Indus River (*Dr. Leith*).

6. CANTORELLA.

Head short. Nose slightly produced, covered with skin. Alveolar process with a single ridge. Thorax orbicular, depressed. Vertebral plates with a continuous central keel when young; the first five-sided, rather produced in front; the second, third, and fourth hexangular; the second and third much broader than long; the fourth smaller, nearly as long as broad. Costal plates with an indistinct central keel. *Nuchal plate none.* Marginal plates square; the front triangular, the rest square; the fourth and sixth scarcely produced on the upper edge. Hinder margin of the shell dentated. Sternum keeled on the sides. Gular plates small, triangular. Toes 4.5.

From a very young specimen in spirits.

1. Cantorella affinis. B.M.

Emys trivittata, *Cantor*, *Malay Rept.* 4.
Tetraonyx affinis (part.), *Cantor*, *Malay Rept.* 6.
Batagur affinis, *Günther*, *Rept. Brit. Ind.* 40, t. iii. fig. *c* (young).
Kachuga affinis, *Gray*, *P. Z. S.* 1869, p. 203.

Hab. Rivers of Malay peninsula, Pinang.

A specimen of the young animal in spirit, from Pinang, from the Cantor Collection, named *Tetraonyx affinis* by

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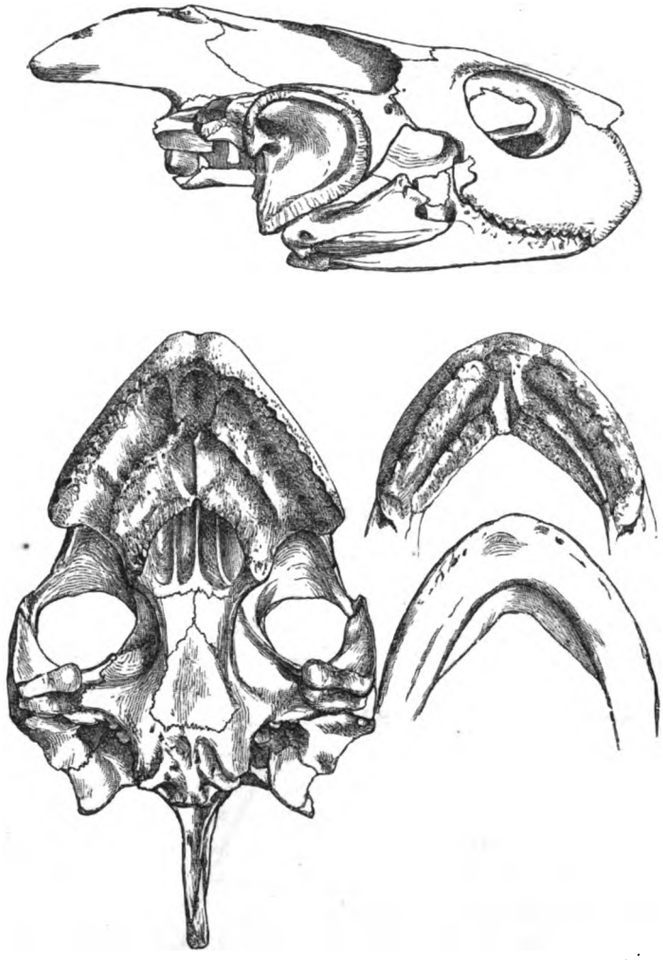
Dr. Cantor. It has five distinct claws on the fore, and four on the hind feet. The shell is nearly circular, and the sides of the sternum are very sharply and strongly keeled; the upper beak is straight-edged, with two small acute teeth in the centre in front; the alveolar surfaces rather broad, the upper with a single triangular ridge separated from its fellow by a central concavity; the lower with a single ridge parallel to the edge; the vertebral shield rugulose, with a broad flat-topped keel; the costal shields with an indistinct central keel more prominent behind, the part above the keel rugulose, that below it smooth; inguinal shields very wide.

Fig. 21.



Hardella Thurgi.

Dr. Günther says there is an adult specimen in the East-India Museum which is the *Emys trivittata* of Cantor; it has the first and second vertebral plates longer than broad, the third not much longer than broad; the upper part of the shell is green, with three black bands, and there is a large black blotch at the anterior angle of the upper-side of each marginal plate.

Section III. *The claws* 5.4. *Nose truncated. Alveolar surfaces of the upper jaw with one straight lateral angular ridge, separated in front by a central longitudinal groove without any longitudinal ridge. Lower jaw with one lateral angular groove continued in a central ridge in front. The fourth vertebral shield elongate, very narrow and produced in front, broad*

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behind, acute at both ends. Cavity of the shell moderately contracted before and behind. Pangshurina.

7. PANGSHURA.

Shell high, shelving on the sides, and angular in the middle of the back. The front vertebral shields keeled. The first vertebral shield broad in front and narrow-acute behind; the third tapering behind. Sternum keeled on the sides.

Skull rhombic; crown flat. Eyes large, lateral. Nose very short. Zygomatic arch short. Upper beak entire; alveolar surface of upper jaw broad the whole length, with a very broad central ridge, with a groove between them in front and a circular pit in front of the groove without any longitudinal ridge behind it. Lower jaw weak; beak produced in front; alveolar surface broad, with a narrow ridge near the inner edge and a central longitudinal ridge to the apex of the beak.

Pangshura, *Gray, Cat. Sh. Rept.* 36.

The head of *Pangshura tecta*, in a specimen in spirit, is unlike the head of *Batagur*. The gape is scaly; but the lower beak is broad in front, with a rather curved hinder edge; and there is a more or less distinctly separate long trigonal shield below the outer margin on the hinder part of the beak. The skin on the crown is continuous, without any grooves; the skin over the tympanum is soft, with some very obscure concentric wrinkles or grooves.

1. Pangshura tecta. B.M.

Batagur tecta, *Gray, Cat. Sh. Rept.* 36.
Emys nomadicus, *Theobald, Journ. Geol. Surv. India*, 1860, ii. 295.
Pangshura tecta, *Gray, P. Z. S.* 1869, p. 204.
Günther, Rept. Brit. India, 33.

A specimen in spirit in the British Museum. The alveolar process wide on the upper and lower jaws. The upper jaw with a subcentral acute ridge interrupted in front by a central longitudinal groove. Alveolar process in the lower jaw broad, with a triangular ridge parallel to the margin, and with a short central longitudinal ridge. Labial edge of the upper beak simple, of the lower beak acute and bent up in the middle.

Skull (as seen through the skin in the stuffed specimen) ovate rhombic, rather high in front, nearly erect on the sides; crown rhombic, produced and acute behind, rather longer from the posterior end to the back edge of the orbit than from that part to the end of the nose; eyes lateral; eyebrows rather convex; zygomatic arch short, narrow, from the middle of the hinder edge of the orbit to the upper part of the front margin of the tympanic cavity, which is only furnished with a narrow edge. Sheath of the upper jaw with straight, closely denticulated edges; lower jaw strong, very convex, and covered with a horny sheath in front. Toes slender, with a few hexangular shields above, very broadly webbed; claws small.

2. Pangshura Leithii. B.M.

Hab. River Poonah.

Dr. Leith has presented to the Museum a skull of this genus which is so much larger than any skulls I have seen that I am inclined to regard it as a new species. The skull is $2\frac{5}{8}$ inches long and $1\frac{1}{2}$ broad.

Skull trigonal; nose nearly erect, rounded in front; forehead flat, narrowed behind; orbits lateral, large, rather longer than high; zygomatic arch broad, forming part of the temple; edge of upper jaw straight, of lower jaw produced and acute in the middle; alveolar surface with a deep conical pit in front, with an angular ridge on each side separated from each other in the centre by a rhombic cavity; the edge of the plate denticulated; openings of the hinder nostrils mesial, with a deep pit behind them, separated by a well-marked ridge; alveolar surfaces of the lower jaw with a sharp denticulated edge and a narrow denticulated internal edge separated from the outer edge by a broad and deep groove, and united together in the centre of the front by a short sharp-edged ridge, which extends to the inner surface of the beak. The rest of the animal and shell unknown. This genus is known from all the other *Batagurina* by the ridges of the upper jaw being separated by a rhombic pit and by the ridge in the lower jaw having a single central sharp-edged ridge to the beak; whereas in all the other genera there are two ridges, separated by a longitudinal groove.

Named after Dr. Leith, who has greatly enriched the Museum Collection in Indian Reptiles.

3. Pangshura ventricosa. B.M.

Thorax ventricose. First vertebral shield elongate, very narrow, rounded behind; second narrow, attenuated behind, margin entire; third small, keeled; fourth elongate, oblong, six-sided, suddenly narrowed and produced in front.

Hab. India (*Jerdon*).

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8. CUCHOA.

Shell high, shelving on the sides. The vertebral plates keeled, sharply produced on the hinder edge; the fourth elongate, narrow in front; the first four-sided; the second obtusely three-sided; the third more produced behind. Cavity of the shell slightly contracted before and behind.

Skull like *Pangshura*.

1. Cuchoa tentoria. B.M.

The first vertebral plate rather broader than long; the outer sides rounded. Shell brown above, beneath blackish, with a more or less broad pale margin to the plates.

Batagur tentoria, *Gray*, *Cat. Sh. Rept.*
Günther, *R. B. I.* t. iv. f. *c*.
Pangshura tentorium & dura, *Gray*, *P. Z. S.* 1869.

Hab. Mysore.

Batagur tentoria: specimens *b* & *c*, in the 'Cat. Shield Rept.,' do not belong to this species.

Skull (as seen through the skin of the stuffed specimen) ovate triangular, sides erect; orbit very large, subsuperior; crown rhombic, produced and acute behind, twice as long from the hinder end to the back edge of the orbit as the length from that part to the end of the nose; zygomatic arch short, convex, the front end forming part of the crown, and wider than the orbit, and the hinder part narrower and only attached to the upper part of the edge of the tympanic cavity. Sheath of the upper jaw broad, high, with a straight simple edge; lower jaw strong, covered with a convex horny sheath in front. Toes slender, broadly webbed to the claws.

Skull (as seen through the skin of the preserved specimen) very like that of *P. tecta*; but the crown is rather more produced behind, or rather the orbits are more in front of the head; the bony temple is broader behind the eyes; and the zygomatic arch is broader, being as wide as the upper half of the front edge of the tympanic cavity. The horny sheath of the upper jaw is rather sinuous, distinctly but closely denticulated. Toes slender, very widely webbed to the claws; claws small.

2. Cuchoa flaviventris. B.M.

Shell brown above, black, with white margin to the shields, beneath; the first vertebral plate square, as long as broad, with the sides inflexed so as to make it more or less urn-shaped; the second narrowed behind.

Pangshura flaviventer, *Günther*, *R. B. I.* 35, fig. on p. 35 (bleached).

Hab. India, Cuttack River (*Surgeon Francis Day*, B.M.).

General Hardwicke figures this species under the name of *Cuchoa* or *Kerraun*. He represents the neck as having a few white stripes. It was found at Futteghur.

Dr. Günther's specimen had probably lost its spots on the sternum by exposure; and this induced Dr. Günther to call it *flaviventris*.

9. JERDONELLA.

Shell oblong, strongly dentated behind. Hinder marginal plates small; *the three hinder on each side occupying the hinder margin of the fifth vertebral shield*. The first vertebral shield pentangular, rather produced in front, truncated behind; the second hexangular, as broad as long; the third elongate, pentangular, truncated in front and produced behind, with a very prominent keel.

1. Jerdonella sylhetensis. B.M.

Pangshura sylhetensis, *Jerdon*, *Proc. As. Soc.* March 1870, p. 69.
Gray, *P. Z. S.* 1870 (ined.).

Hab. Sylhet; stream in the Terria Ghat, Khasi Hills.

10. EMIA.

Shell oblong, elongate, convex, interruptedly keeled. Vertebral shields rather elongate; first, second, and third oblong, four-sided; the second nearly as broad as long, the first and third longer than broad, especially the latter; the third elongate, four-sided, truncated before and behind; fifth very long, much narrowed in front; the sixth broad, triangular, truncated in front; all keeled on the hinder edge. Lateral marginal plates expanded; nuchal plates small. The cavity of the shell not contracted in front. The head moderate; crown flat; orbits large, lateral; zygomatic arch short, forming part of the temple. Nose erect. Upper beak with a simple edge; lower beak acute and bent up in front.

The alveolar surface of the upper jaw moderately wide, with a small round pit in front and a narrow ridge parallel to the outer edge of the beak. Lower jaw with a broad sharp edge and a ridge separated by a deep groove on the inner margin. Toes slender, 5 . 4, broadly webbed. Claws very long, slender. Skull like *Pangshura*; but the ridges in the alveolar surface of the upper jaw are not so broad, and are interrupted by a wider central groove in front.

The genus is intermediate in character between the sections *Kachuga* and *Pangshura*. It has the elongated

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rhombic fourth vertebral plate of *Pangshura*; but the feet are very broad, the toes long, the claws elongate; the back is evenly rounded, and the second vertebral plate broad and six-sided, as in *Kachuga*.

1. Emia Smithii. B.M.

Shell oblong above, rather wider and very slightly dentated behind; the back regularly rounded, interruptedly and subnodosely keeled. The first three vertebral shields oblong; the first rather urceolate; the second subhexangular, rather broader than long; the third narrower, nearly twice as long as broad, with a prominent keel on the hinder half; the fourth very long, tapering, and very narrow in front, square, truncated, and keeled behind; nuchal shield small; marginal shields broad, the sixth and tenth with the upper edge produced upwards; the sternum flat, slightly keeled on the sides, white, it and the underside of the marginal shields blotched with blackish; the gular plate triangular.

Batagur Smithii, *Gray*, *P. Z. S.* 1863.
Pangshura Smithii, *Günther*, *Rep. Brit. India*, p. 32, figs. 1 & 2 on p. 2.

Hab. North-western India; Punjab; "River Chenab, 3rd December, 1848;" Indus (*Dr. Leith*).

Shell yellow, the keel of the first and second vertebral shields black.

The younger specimen is not so strongly keeled; the second and third vertebral plates are rather broad compared with their length; and the fourth is more nearly lozenge-shaped.

I have named this species after my excellent friend Sir Andrew Smith, the late Director-General of the Army Medical Board, an encourager of science, and a very accurate and industrious herpetologist and traveller.

Section IV. *Claws* 5.4. *Nose truncated. Alveolar surface of the upper jaw with one angular ridge suddenly bent outward in front, and one groove in the lower jaw. The fourth vertebral plate hexangular, broad. Cavity of the shell not contracted.* Moreniina.

11. MORENIA.

Shell oblong, convex, noduled on the keel when young. The vertebral shields square, transversely six-sided, rather longer than broad, becoming rather longer in comparison in the older animals. The fifth as broad in front as behind.

Toes 5.4. Cavity of the shell only slightly contracted in front and behind.

The skull:—The alveolar surfaces of the upper and lower jaws very wide, as wide behind as before, rugulose, tubercular; the upper one with a very strong triangular submarginal ridge ending short of the centre and in front sharply turned towards the outer margin; the central part concave in front, and flat behind; the portion behind the ridge very broad. Lower jaw with a very strong triangular ridge stopping short of the centre, which is concave. The upper beak even on the side, with a broad triangular central nick with a slight tooth on each side; the lower with a short conical centre; the whole surface of the upper and the outer surface of the lower grooved and rugose. The nostrils small, circular, pierced in a horny plate that edges the nose and with a lower process produced downwards, on the upper edge of the beak.

Emys, sp., *Günther*, *R. B. I.*
Batagur, sp., *Gray*.

Dr. Günther removes the species which I had described as *Batagur* to the genus *Emys* (Reptiles of British India, p. 22); but the examination of the skull confirms the correctness of my first determination.

1. Morenia Berdmorei. B.M.

Emys ocellata, *Blyth*, *J. A. S.* xxii. 645, xxiv. 481.
Günther, *Rep. Brit. Ind.* 22, not *Duméril & Bibron*.
Emys Berdmorii (& Berdmorei), *Blyth*, *J. A. S.* xxvii. 281.
Batagur ocellata, *Gray*, *P. Z. S.* 1856, p. 10; *Ann. & Mag. N. H.* 1857, xix. p. 348, not *Cat. Sh. Rept.*
Batagur Berdmorii, *Blyth*, *J. A. S.* xl. 1863, pp. 75, 77.
Theobald, *Journ. Linn. Soc.*

Hab. Martaban and Southern Burma (*Blyth*); Sitang and Tenasserim River (*Blyth*); Pegu and Tenasserim, abundant, excellent eating.

"Quite distinct from *B. ocellata*, Dum. & Bib., from Bengal."—*Theobald*.

Shell oblong, revolute on the sides, with a broad, central, nodulous keel when young; the nodule at the hinder edge of each vertebral plate produced; each vertebral plate with an oblong, dark, central spot; each costal plate with a large, annular, central, black spot, surrounded by a broad pale ring; sternum strongly keeled on the sides.

Head dark olive; narrow white streaks from the upper part of the nose, edging the crown; a smaller streak from the lower part of the nose, continued on the upper margin of the beak, along the neck, and under the tympanum; a narrow streak from the middle of the back edge of the orbit and over the ears; chin and throat with a central and two lateral spots, and some intermediate spots; these are

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sometimes confluent. Sternum flat, keeled and high on the sides, pale yellow; edge of sternum and underside of the margin of the thorax reddish, not spotted.

Var. Young. Sternum black, with a white lateral margin and white edge to the thorax.

The cavity of the shell only slightly contracted in front and behind; the vertebral shields keeled in the young specimen, the keel gradually becoming more indistinct and forming three dark tubercular plates in the older specimens; the costal plates of the young specimen with a central black spot surrounded by a pale ring, and a dark streak above it; this spot and ring become gradually dilated as the shell increases in age; the undersurface pale, whitish.

A beautiful specimen of a species I was inclined to believe referable to *Emys ocellata* of Duméril and Bibron (Erpétologie générale, ii. 329, t. 15. f. 1)—a species which I have not before seen in any English collection. I should have no doubt of its being that kind from the description; but in the figures the dark spots on the costal plates are represented as being nearly regular, circular, broad rings round a pale circular centre, while in the specimen received from Professor Oldham the dark mark on the costal plate is an irregular oblong or square mark only, partly surrounding the paler centre of the shield.

Mr. Blyth, in the same paper, observes, "*Emys ocellata* would appear to be the commonest species in the Burmese rivers; and its naked parts are olive-grey, the crown blackish, with a yellowish-white V-like mark over the snout, continued as a supercilium over each eye and back upon the neck, another straight line behind the eye; and both are often more or less broken into spots.

"Carapax dusky, mottled with yellowish; a great black spot surrounded with a pale *areola* upon each discoidal [!] plate; dorsal ridges blackish, with pale border; and lower parts wholly yellowish white.

"Some are brighter-coloured than others, and the ocelli become proportionally smaller as they increase in size.

"The carapax of our largest specimen measured 9 by 6¼ inches, but it probably is not full-grown."—*P. Z. S.* 1856, p. 183.

Hab. Burmah.

2. Morenia ocellata.

Batagur ocellata, *Gray, Cat. Sh. Rept.* p. 36.
Theobald, Cat. Rept. As. Soc. Calcutta, 40, t.

Hab. Calcutta.

Fam. VII. CHELYDRADÆ.

Head large, covered with a thin, hard skin, or hard bony plates; temporal muscle large, covered with the skin, and protected on the edge by a well-developed band-like zygomatic arch. Eyes lateral or superior, often rather close together. Thorax covered with horny plates. Sternum attached to the thorax by a bony symphysis, generally small (compared with the size of the thorax), and sternum cross-like, sometimes large (nearly as big as the thorax); sternal shields variable in number, from 7 to 11, never 12. Toes short, spreading, webbed to the claws, shielded above.

Skull with a well-developed band-like zygomatic arch, extending from the orbit to the tympanic cavity, leaving a large wide space for the temporal muscles. Palate flat; internal nostrils anterior. Alveolar plate broad and smooth. Iris annular, without any spot on the sides.

Emydidæ, §§ A. *c* & B. *a*, *Gray, Cat. Shield Rept.* 43, 48. Chelydroidæ and Cynosternoidæ, *Agassiz*, 341 & 343.

Synopsis of the Genera.

Section I. *Sternum small, cross-like, narrow at the ends. Head and tail large.* Crucisterna.

Tribe I. Chelydraina. Sternal plates 10, with a broad one on each side over the produced parts of the sternum.

1. **Macrochelys.** Eyes lateral and distant.
2. **Chelydra.** Eyes superior, rather close together.
3. **Palæochelys.**

Tribe II. Staurotypina. Sternal plates 7; the gular, humeral, and pectoral plates on each side united.

4. **Staurotypus.** Sternum broad and truncated in front.
5. **Stauremys.** Sternum narrow, tapering and acute in front.

Tribe III. Aromochelyina. Sternal shields 11; the gular pair united into a narrow linear shield.

6. **Aromochelys.**

Section II. *Sternum broad, front and hinder lobes moveable on the central portion; sternal shields* 8 *or* 11. Kinosterna.

Tribe IV. Kinosternina.

7. **Kinosternon.**
8. **Swanka.**

Section I. *The sternum small, cross-like, narrow at the ends. Head and tail large.* Crucisterna.

Tribe I. CHELYDRAINA.

Sternum solid, cross-like, acute before; sternal plates 10, with a broad one (the displaced abdominal plate) on

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each side over the produced sides of the sternum. Palate flat; internal nostrils anterior. Alveolar plate flat, more or less broad. Iris annular, uniform.

1. MACROCHELYS.

Eyes lateral, far apart; iris annular. Alveolar plate very broad. Skull figured in Cat. Shield Rep. t. 38, 39, 40.

Macrochelys, *Gray, P. Z. S.* 1855, p. 200, 1869, p. 179.
Gypochelys, *Agassiz*, 414.
Macroclemys, *Gray, Cat. Shield Rep.* 48 (misprint).

1. Macrochelys Temminckii. B.M.

Macrochelys Temminckii, *Gray, P. Z. S.* 1855, p. 200.
Macroclemys Temminckii, *Gray, Cat. Shield Rep.* 49, t. 38, 39, 40 (misprint).
Gypochelys lacertina, *Agassiz*, 414.
G. Temminckii, *Agassiz*, t. 5. f. 23–27 (young).

Hab. N. America.

2. CHELYDRA.

Eyes superior, close; iris annular. Alveolar plate rather narrow. Skull figured Cat. Shield Rept. t. 38 & 40.

Chelydra, *Gray, P. Z. S.* 1855, p. 200, 1869, p. 179; *Cat. Shield Rep.* 48.
Agassiz, Contrib.

Skull depressed, very broad behind, crown rhombic, sides of the face shelving outwards; orbit very large, anterior, subsuperior on the shelving side of the face; the cavity for the temporal muscle very wide; the zygomatic arch very broad, broader than the orbit and much broader than the oblong erect tympanic cavity. The palate flat, internal nostrils in the front of the palate; the outer edge sharp; with a central anterior bony hook, and with a broad, flat, smooth alveolar plate parallel with the outer edge. The lower jaw moderately strong, narrow in front, with a conical central bony process, and with a smooth, shelving, rather concave band inside the sharp margin. (Skull figured, Gray, Cat. Shield Reptiles, 48, tab. 38 & 40. f. 2.)

A young specimen in spirits, which was brought from North America, and presented by Mr. Arthur Russell, F.Z.S., is very beautifully marked on the sternum and underside of the margin of the thorax. The sternum is black, with symmetrical variously shaped white spots, most abundant near the outer edge; the underside of the margin of the thorax is yellow, varied with dark edges to the shields. The animal is pale brown and more or less yellow-spotted. There is a series of triangular yellow spots on the lower edge of the lower beak.

1. Chelydra serpentina. B.M.

Chelydra serpentina, *Gray, Cat. Sh. Rept.* 48, t. 38. f. 1, & 40. f. 2.
Agassiz, Contrib. 417, t. 4. f. 13–16, t. 5. f. 18, 19, t. 9*c*. f. 4–6, 9, 12, 15, 17.
Wagler, N. Syst. Amph. t. 5. f. 46, 47.

Var. mexicanæ, *Cope, Proc. Acad. Nat. Sci. Philad.* 1865, p. 187.

Hab. N. America; Mexico.

See Emydosaurus rossignonii, *Bocourt, Ann. Sci. Nat.* 1868, x. p. 121 (Guatemala).

See Chelydra Murchisonii, *Bell, Trans. Geol. Soc.* iv. 279, t. 24.
Von Meyer, Faun. der Vorwelt, 12, t. 11. f. 2, 12; *Palæontogr.* ii. 238, t. 26–28.

Front end of plastron widened as in *Platysternon*; hinder end pointed, as in *Chelydra*.

Hab. Oeningen (fossil).

Chelydra Dechenii, *Meyer, Palæontogr.* ii. 242, t. 28–30. f. 5, 6.

Front end of plastron acute; hinder end truncate.

3. PALÆOCHELYS.

Sternal plates 8; the sternum very broad and rounded in front and notched behind. The abdominal plate displaced, produced on the side covering part of the sternum. The vertebral plates hexangular.

1. Palæochelys Bowerbankii.

Platemys Bowerbankii, *Owen & Bell, Foss. Rept. London Clay*, pl. 23.

Hab. Sheppey (fossil).

The figure quoted shows no indication of the intergular plates which the authors consider a character of *Platemys*.

Tribe II. SAUROTYPINA.

Sternum cross-like, middle portion narrow, covered by the abdominal plates, and extended to the thorax; the front and hinder lobes often moveable on the central fixed one. Axillary and inguinal plates large; sternal plates 7; the gular, humeral, and pectoral plates of each side united; the femoral and anal small, united into one large ventral shield. Alveolar plate very broad, smooth. Internal nostrils far back.

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4. STAUROTYPUS.

Femoral and anal shields small, united into one long rhombic shield. Iris ——? Sternum broad and truncated in front. Sternal plates 7. The gular, humeral, and pectoral plates of each side united into one. The abdominal plate broad; the femoral pair elongate; the anal pair united into one plate.

Staurotypus, *Wagler*.
Gray, *P. Z. S.* 1864, p. 127, 1869, p. 180; *Cat. Sh. Rept.* 47.

1. Staurotypus triporcatus. B.M.

Staurotypus triporcatus, *Gray*, *Cat. Sh. Rept. B. M.* 47, t. 20 B; *P. Z. S.* 1864, p. 127.
Cope, *Proc. Acad. Nat. Sc. Phil.* 1865, p. 188.

Hab. Mexico (*Wiegmann*); Vera Cruz (*Sallé*).

5. STAUREMYS.

Sternum narrow, tapering and acute in front. Sternal plates 2.2.2.1. Tail crested.

This genus has the form of the sternum and the crested tail of *Chelydra*, with the sternal shields of *Staurotypus*.

1. Stauremys Salvinii. B.M.

Staurotypus (Stauremys) Salvinii, *Gray*, *P.Z.S.* 1864, p. 127, 1869, p. 179. f. 5.

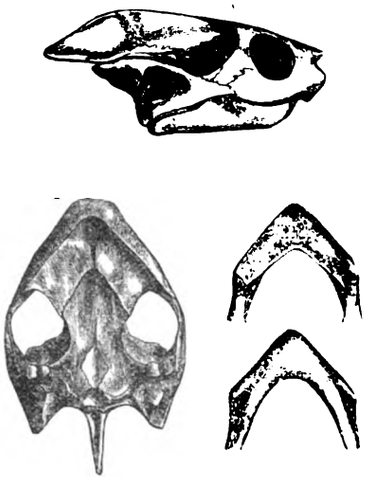
Hab. Haumanchal, Guatemala (*Salvin*).

Head very large, swollen, crown covered with a thin soft skin; face conical, rather produced; nose terminal; mouth inferior; beak large, dentated on the edge; chin with two beards; throat warty; skin of body and limbs granular; the fore legs have several slender, very broad, arched, band-like shields across the inner side, the middle one being the broadest; toes well developed, strong; upper surface covered with a single series of band-like shields, united to the claws by a wide, well-developed web; claws 4–5, strong, elongate, acute; tail short, conical, angular above, with a central and a lateral series of tubercles, forming three short crests; the thorax oblong, covered with three short continuous keels; marginal shields rather narrow, elongate; sternum cross-like, small compared with the dorsal disk, narrow, slightly rounded before, acute behind, united to the dorsal disk by a narrow lateral process; sternal plates 7, thin, three pairs and a single odd one behind; the first pair elongate, longer than broad (probably the two first pairs of other *Emydæ* united); the second pair broad, produced on the side, so as to cover the greater part of the cross-like sternum; the third pair elongate, narrow; the hinder plate rhombic, rather longer than broad, acute in front and behind; the axillary and inguinal plates large, covering the space between the outer lateral edge of the second pair of shields and the marginal plates. The front lobe of the sternum is very moveable at the suture between the first and second pairs of sternal plates in the young specimen, and has a considerable amount of mobility in the adult specimen.

The shell is brown; the head is dark olive; the temple and the side of the neck pale-marbled; underside of the limbs whitish.

Wagler represents the anal shields of *S. triporcatus* as

Fig. 22.



Stauremys Salvinii.

divided. In the large specimen in the British Museum they are united into a single rhombic shield, as in *S. Salvinii*.

In the British Museum there is a skeleton of *Staurotypus Salvinii*, prepared by Mr. Edward Gerrard, Jun., from a specimen that was alive in the Zoological Gardens.

The skull is ovate, rather solid, with a flat, short, rhombic crown and forehead. Zygomatic arch broad, flat, short, slightly arched outwardly. Tympanic cavity oval, erect. The nose conical, truncated, and produced conically beyond the aperture of the mouth. Nose-holes large, terminal, four-sided. Orbit lateral, moderate, circular. The labial edges thin, rounded externally, with a short,

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slightly arched edge. Alveolar surface of the upper jaw flat, broad, smooth, with an oval central impression in the front; the internal nostrils far back, nearly on a line with the front edge of the apertures for the temporal muscles. Lower jaw strong, thick, with a convex, anterior, lower surface. Alveolar surface broad, concave, with a short outer edge, nearly as wide on the hinder part of the sides as in front, and with an acute, conical, central process. The jaws and alveolar surfaces are somewhat as in *Damonia*, but the nose is rather more produced.

1. *Claudius angustatus*, Cope, Proc. Acad. Nat. Sc. Phil. 1865, p. 188; Proc. Am. Phil. Soc. t. ix. "Only differs from *Staurotypus Salvinii* in the immobility of the anterior lobes of the sternum and absence of inguinal and maxillary plates."—*Cope.* (Mexico.)

2. *Claudius megalocephalus*, Bocourt, Ann. Sc. Nat. 1868, vol. x. p. 123. (Mexico.)

Tribe III. AROMOCHELYINA.

Sternum truncated in front, nicked behind; sternal shields 11; gular pair united into a narrow linear shield. Head large; zygomatic arch very broad, strong, arched; iris annular. Alveolar surface flat; of the upper jaw broader behind and separated by a wide groove in front.

Aromochelyina, *Gray, P. Z. S.* 1869, p. 180.
Ozothecoidea, *Agassiz, Contrib.* 424.

6. AROMOCHELYS.

Aromochelys, *Gray, P. Z. S.* 1855, p. 199, 1869, p. 181; *Cat. Sh. Rept.* 46.
Othotheca, *Agassiz, Contrib.* 425.
Goniochelys, *Agassiz, Contrib.* 422.

"Sternum narrow, cruciform. Valves joined to the abdominal portion of the chest by sutures, the lateral teeth of which are so long as to admit of but little motion, especially on the posterior one, being long and narrow, without any groove on the inner part. Tail unarmed."—*Leconte.*

1. Aromochelys odorata. B.M.

Aromochelys odorata, *Gray, Cat. Sh. Rept.* 46; *P. Z. S.* 1855, p. 199; 1869, p. 181.
Ozotheca odorata, *Agassiz, Contrib.* 425, t. 4. f. 1–8, t. 6. f. 11, 12, t. 9. f. 7, 8.

Young brown-dotted.

Kinosternon guttatum, *Leconte, Proc. Acad. Nat. Sci. Phil.* 1854, iii. 183.
Gray, Cat. Sh. Rept. (append.) 79.
Var.? Ozotheca tristycha, *Agassiz, Contrib.* 425, t. 5 f. 20–22.

Hab. North America.

An adult specimen, in spirits, in the British Museum, from North America, presented by Odo Russell, Esq.

Head large; nose produced, conical, acute, shelving to the mouth below; nostrils surrounded by a very small fleshy margin. Head dark olive, punctulated, with a narrow white streak from the upper and the lower edge of the nose, the upper streak edging the crown over the orbit to the nape; the lower diverging under the eye and tympanum and crossing the beak. The lower beak with a streak on each side of the centre in front, diverging to the chin on the lower edge of the horny sheath. Neck with streak of roundish confluent spots.

2. Aromochelys carinata. B.M.

Aromochelys carinata, *Gray, Cat. Sh. Rept.* 47; *P. Z. S.* 1855, p. 194.
Goniochelys triqueter, *Agassiz*, 422.

Var.? Goniochelys minor, *Agassiz, l. c.* 422.

Hab. North America; Louisiana.

Section II. *Sternum broad. Sternal shields* 8 or 11. *The short process that unites the sternum to the thorax covered with the elongated axillary and inguinal plates. Front and hinder lobes of the sternum generally moveable on the fixed central portion. Internal nostrils anterior. Alveolar plate flat, rather broad.* Kinosterna.

Tribe IV. KINOSTERNINA.

Emydidæ § *c*, *Gray, Cat. Sh. Rept.* 43.
Cinosternoidæ, *Agassiz, Contrib.* i. p. 418.
Terrapenina, *Gray, Ann. Phil.* x. 211 (1825).
Kinosternina, *Gray, P. Z. S.* 1869, p. 180.

7. KINOSTERNON.

Kinosternon, § 2, *Gray, Cat. Sh. Rept.* 45; *P. Z. S.* 1855, p. 398.
Leconte, J. A. N. S. Philad. 1854, iii. 183.
Thyrosternon, *Agassiz.*
Platythyra, *Agassiz, Contrib.*
Sternothærus, *Fitzinger.*

"The anterior valve of the sternum joined to the abdominal portion by a ligament, and partly by a suture, the

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hinder by suture only. Wings tolerably long, with a deep divided groove on the anterior part."—*Leconte.*

Toes of fore and hind feet enclosed in the skin to the claws.

The skull of *Kinosternon pennsylvanicum* in the British Museum is depressed, ovate triangular; crown rhombic, narrow behind, short, only slightly produced behind the orbits; orbit lateral, large; zygomatic arch broad, rather convex and prominent behind, including the whole front edge of the small tympanic cavity; palate deeply concave in the centre, with three longitudinal ridges on each side of the central line, very narrow behind; upper jaw with a broad intermediate ledge edged with a slightly raised ridge; lower jaw with a shelving edge to the back, and hooked in front; iris annular.

* *Head without any streak over the eyes.*

1. Kinosternon pennsylvanicum. B.M.

Thyrosternon pennsylvanicum, *Agassiz*, 427, t. 4. f. 7–12, t. 5. f. 16, 17.
Kinosternon pennsylvanicum, *Gray, P. Z. S.* 1855, p. 198, & 1869, p. 183.
Emys trijuga, *Mus. Utrecht.*

2. Kinosternon punctatum. B.M.

Kinosternon punctatum, *Gray, Cat. Sh. Rept.* 45; *P. Z. S.* 1855, p. 198.
Kinosternon sonoriense, *Leconte, Proc. Acad. Nat. Sci. Phil.* 1854, iii. 183.
Gray, Cat. Sh. Rept. 79.
Thyrosternon sonoriense, *Agassiz*, t. 5. f. 8, 12.

Hab. Sonora.

** *Head with a pale streak over the eyes.*

3. Kinosternon hippocrepis. B.M.

Kinosternon hippocrepis, *Gray, P. Z. S.* 1855, p. 198; *Cat. Shield Rept.* 46.
Platythyra flavescens, *Agassiz, Contrib.* 430.
Cinosternon flavescens, *Agassiz, Contrib.* t. 5. f. 12–15.

Hab. New Orleans.

*** *Head* ——?

4. Kinosternon Doubledayii. B.M.

Kinosternon Doubledayii, *Gray, Cat. Sh. Rept.* 45, t. 20.

Hab. California.

5. Kinosternon hirtipes.

Kinosternon hirtipes, *Wagler, N. Syst. Amph.*
Gray, Cat. Sh. Rept. 46.

Wagler (Syst. Amph. t. 5. f. xxxi.–xxxvii.) figures the skull and lower jaw of *Cinosternon hirtipes*. It is very like the skull of *Chelydra serpentina* in form and structure. The temporal fossæ are very large and wide; skull depressed and not covered by the bone; orbit moderate, lateral, anterior; the lower jaw is thick, angular, and produced in front.

Supposed by Agassiz to be the male of *Thyrosternon integrum* (see 'Contributions,' p. 429).

8. SWANKA.

Sternum broad. Sternal lobes as broad as the opening in the thorax. Sterno-costal suture elongate, narrow. Abdominal shields larger than the front lobes of the sternum. Skull: zygomatic arch moderate, rather narrow. Alveolar processes of the upper jaw flat, rather narrow in front and expanded behind, separated in front by a wide space; lower jaw broad, linear, concave, with a sharp outer edge, and bent up tip in front.

Kinosternon, § Swanka, *Gray, Cat. Tort. B. M.* 32, 1844; *Cat. Sh. Rept.* 44; *P. Z. S.* 1869.
Kinosternon, section I., *Leconte, Proc. Acad. Nat. Sc. Phil.* 1854, p. 183.
Gray, Cat. Sh. Rep. 79.
Cinosternon, *Fitzinger, Syst.* 29.
Agassiz, Contrib. 446.

a. *The sterno-costal suture and the abdominal shields as long as the front sternal lobe; hinder lobe rounded at the ends. Thorax three-keeled. Vertebral plate elongate.*

1. Swanka scorpoides. B.M.

Kinosternon scorpoides, *Gray, Cat. Sh. Rept.* 44.
Agassiz, Contrib. 46, 44.
Cinosternon scorpoides, *Wagler, N. Syst. Amphib.* t. 5. f. xxxi.–xxxvii. (skull).
Owen, Cat. Osteol. Mus. C. S. p. 191. n. 992 (skeleton).
Leconte, Proc. Acad. N. S. Philad. 1854, p. 183.
Duméril, Arch. du Mus. vi. t. xvi. f. 3.

Hab. Surinam (*Leconte*); Mexico (*Sallé*).

Skeleton in the College of Surgeons, No. 992. Skull thin, light; nose rather produced; crown rhombic, flat; sides of face flat; orbit moderate, lateral; zygomatic arch

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very broad, strong, nearly flat. Palate flat. The alveolar edge smooth, rather wider behind; internal nostrils close, anterior between the fronts of the alveolar plates; lower jaw rather strong, broad and convex in front, more slender than the sides; the upper edge broad, rather concave, with an acute central process.

The two small specimens from M. Sallé both with rather rough and worn dorsal shields. One of them is keeled the whole length of the back, and the other only keeled over the hinder part of the back. They both have the front lobe of the sternum very nearly of the same length as the rather long abdominal shield. I cannot take on myself to say if they are of two species, or only varieties of the same, without having more information respecting them and the development of the animals.

After the study of numerous specimens, many of them with the animals of this genus in different states of preservation, which I believe in a great measure depends on the kind and clearness of the water they inhabit, I am inclined to believe that they may be best divided into those that live at Surinam or Guiana, on the east side, and those that live in Mexico, on the west side of the American continent; but I have not been able to find any permanent character to separate them.

b. *The sterno-costal suture and the abdominal shields not so long as the front lobe of the sternum; hinder lobe rounded behind. Thorax not keeled. Vertebral plate longer than broad.*

2. Swanka maculata. B.M.

The sides of the head, neck, and throat grey, with a few indistinct dark-edged subcircular spots, largest on the front of the chin; fore legs with three cartilaginous ridges. thorax dark olive; sternum-ridges and lower side of margin yellow, with dark spots on areoles of shields; the fore and hinder ends of sternum regularly rounded; vertebral shields longer than broad.

Hab. Mexico (*Sallé*); Vera Paz (*Salvin*).

A specimen in spirit, collected by M. Sallé in Mexico. The sternum and underside of the margin pale yellow; the areola of the third and fourth pairs of sternal plates, which are situated on the outer side of the anterior transverse suture, is surrounded by an irregular-shaped brown ring. A more or less obscure indication of such a ring is to be seen surrounding the areola of the other sternal plates. The areola is on the outer hinder side of all the sternal shields, except of the fourth or abdominal pair, where it is on the front outer angle.

Two large specimens in spirit, from the Lower Forest of Vera Paz, received from Mr. O. Salvin. They are like those from Mexico, but darker below. The head is large, very hard, and the beak and temporal muscles very strong. The two beards are in front of the chin, quite near the hinder edge of the lower beak. The zygomatic arch is wide, strong, and rather convex. Toes very strong, short, with a few bands above near the ends, with narrow webs to the claws. The fore legs with the skin smooth, and three oblique, arched, sharp-edged horny cross ridges just above the feet, the lower one the shortest.

In the band over the orbit this species agrees with *Kinosternon hippocrepis*, figured from a young specimen, Gray, Cat. Shield Rept. t. 20 c. f. 3, 4; but the sternum is much broader than in that species, and more completely closes the cavity of the thorax. Thorax about 4 inches long.

A large well-grown specimen in spirit in the British Museum, received from M. Brandt, of Hamburg, as from North America (?). The skull is pale olive, speckled with darker brown; thorax pale bright brown, the underside of the margin of the thorax being uniform blackish brown.

Four specimens in spirit, obtained by M. Sallé at Papalco Apoia; but it is not stated that they were from the same district. If they were, it will go to prove that the length of the front lobe, as compared with the length of the abdominal shield, is only a character of age and not of specific distinction. They have each a speckled or mottled neck, and are without any head-streak. The two larger specimens vary in other particulars, but probably from local circumstances, as one has a good smooth shield, and of the other the shield is rugose and covered with mud and algæ, and the whole specimen looks as if it had lived in dirty water. They both have the front lobe of the sternum about one-fourth of its length longer than the abdominal shields, which are short.

c. *The sterno-costal suture and the abdominal shields not so long as the front lobe of the sternum; the hinder lobe of the sternum slightly truncated behind. Thorax not keeled. Vertebral plates as broad as long.*

3. Swanka fasciata. B.M.

Head olive, with a dark-edged pale streak from the nostril, over the eye, to the upper part of the tympanum (it is

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narrow before, and wider behind the eyes), and with a streak from the lower edge of the orbit, over the angle of the jaw on the side of the neck; occiput and back of neck white-spotted. The lobes of the sternum are rather narrower than the opening of the thorax.

Hab. ——? (from *M. Brandt*).

4. Swanka mexicana.

Kinosternon mexicanum, *Leconte, Proc. Acad. Nat. Sci. Phil.* iii. 183, 1854, Oct.
Gray, Cat. Sh. Rept. 79.

Sternum rounded behind and before.

Hab. Mexico (*Leconte*).

5. Swanka integra.

Kinosternon integrum, *Leconte, Journ. Acad. N. S. Philad.* iii. 183, 1854, Oct.
Gray, Cat. Sh. Rept. 79.
Thyrosternon integrum, *Agassiz, Contrib.* 429.

Sternum large, entirely closing the thorax, slightly nicked behind.

Hab. Mexico (*Leconte*).

Agassiz places this species in *Thyrosternum* by an oversight, I expect (Contrib. 429).

6. Swanka longicaudata.

Kinosternon longicaudatum, *Spix, Bras.* 17, t. 12.
Leconte, Proc. Acad. N. S. Phil. iii. 183, 1854.
Gray, Cat. Sh. Rept. 79.

Hab. Brazil (*Leconte*).

7. Swanka leucostoma.

Kinosternon leucostomum, *Duméril & Bib. Erp. Gén.* ii. 570.
Duméril, Arch. du Mus. 236, t. 17.
Gray, Cat. Sh. Rept. 46, 79.
Leconte, Proc. Acad. N. S. Phil. 1854, p. 183.

Hab. N. America, New Orleans, New Granada (*Leconte*).

8. Swanka cruentata.

Kinosternon cruentatum, *Dum. & Bib. Cat. Mus. H. Nat.* 16.
Duméril, Arch. du Mus. vi. p. 238, t. 16. f. 1, 2.
Gray, Cat. Sh. Rept. 44.

Hab. N. America (*Duméril*).

9. Swanka trilirata.

Kinosternon triliratum, *Leconte, Proc. Acad. N. S. Phil.* 1859, p. 6.

Hab. Mexico (*Leconte*).

10. Swanka Henricii.

Kinosternon Henricii, *Leconte, Journ. Acad. N. S. Phil.* 1859, p. 4.

Hab. Mexico (*Leconte*).

Section II. *The temporal muscle covered with a long hood formed by the extension of the zygomatic arch. Head very large. Sternal shields* 11.

Fam VIII. PLATYSTERNIDÆ.

Head very large, covered with a thick, hard, bony case. Skull thick, hard. Upper jaw with a strong short-edged central hook. Zygomatic arch much dilated posteriorly, and forming a bony covering over the temporal muscles. Toes 5 . 4, short, free at the ends; the three middle ones of the fore foot and the two middle ones of the hind foot longest; claws compressed, acute. Tail cylindrical, elongated, covered with rings of square shields. Thorax thin. Sternum solid, broad, attached to the thorax by a bony extension covered with the ends of the pectoral and abdominal plates; not transversely divided, separated from the marginal shields by a longitudinal series of small shields.

Emydidæ, *b*, *Gray, Cat. Sh. Rept.* 49.
Emydidæ, § B, *Gray, Cat. Tort. in B.M.* 3.

The families *Platysternidæ* (allied to *Emydidæ*) and *Pellocephalidæ* (allied to *Chelydidæ*) have large heads like the Turtles (*Cheloniadæ*), and, like them, the temporal muscles are covered with a bony case. This may be to protect the head, which is too large to be contracted within the thorax: but the small-headed genera of *Chelydidæ*, on the other hand, have the temporal muscle more naked than any genus of *Emydidæ*; yet these animals never withdraw their head, and only shelter it by placing it when at rest under the sides of the shell.

1. PLATYSTERNON.

Platysternon, *Gray, Cat. Sh. Rept.* 49.
Platisternum, *Günther.*

Front of the fore legs covered with large, unequal-sized, band-like shields; toes short, strong, covered above with band-like plates, narrowly webbed at the base; the three middle front and two middle hinder longer and equal. Nose truncated; nostrils on the upper edge. Upper jaw strongly hooked, with a notch on each side. Skin granular.

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1. Platysternon megacephalum. B.M.

Platysternon megacephalum, *Gray, Cat. Sh. Rept.* 49.

Hab. China.

2. Platysternon peguense. B.M.

Platysternon megacephalum, *Theobald, Journ. Linn. Soc.* x. 1868, p. 17.

Young described by Theobald (*l. c.* 18).

Hab. Pegu (rare).

Pale olive; shields smooth, thin, with three small black spots on each vertebral shield, the largest on the rounded hinder part of the keel (the areola), and one on each small compressed tubercle rather behind the centre of each costal shield, and a more or less dark spot on the hinder outer edge of each marginal shield; sternum and underside of the margin pale yellow, some of the sternal shields with black edges. Animal pale yellow; crown, back of the neck, and upper surface of the tail olive; vent and upper surface of the ribs blackish olive; a black-edged yellow streak from the back of the orbit to the occiput, over the ear; tympanum superficial, small.

Suborder III. Pleuroderes.

Toes developed, spreading, webbed; claws 5.4 or 4.4, acute. Neck contractile, and bent back under the side margin of the shell when at rest; pelvis attached to the vertebra and sternum. Thorax covered with horny shields. Sternal shields 13. The gular plate marginal or submarginal.

Chelydidæ, *Gray, P. Z. S.* 1855, p. 200, 1864, p. 128, and 1869, p. 208; *Cat. Sh. Rept.* 50.

The characters which have hitherto been used to separate the genera of the order are very slight. This only arises from the genera having been hitherto characterized by some easily seen external peculiarities, which are often, as in this case, mere superficial indications of very different internal organizations. This apparent slightness disappears when the skulls and other parts of the skeletons of the different genera are examined, as may be proved by consulting the figures of the skulls and skeletons given in the Atlas of Plates to Wagler's 'System of Amphibia,' published in 1830, which has been too much neglected by more recent writers on the subject.

Unfortunately we have the bones of only a few examples of the family in the collection of the British Museum, and there are only two skeletons in the Museum of the College of Surgeons; nor do I know of any other osteological collections which have more. These, however, and the figures of Cuvier and Wagler before referred to, are sufficient to show the outlines of an improved arrangement of the genera, and to afford more important characters for them.

In P. Z. S. 1864, p. 128, I proposed an arrangement of the genera, founded on an examination of the skulls. I have since obtained the skull of *Chelodina Colliei*. It does not render necessary any alterations in the system; but I would propose that the place of the genus (*Chelodina*) in the series should be rather altered: instead of following *Hydraspis* in *Hydraspidina*, I think that it had better be arranged before it in that tribe, as the skull is more depressed and has a more slender lower jaw, and many other characters render it intermediate in form between the genera *Hydraspis* and *Chelys*.

Synopsis of the Families.

1. **CHELYDIDÆ.** Head much depressed, covered with soft skin. Beak covered with fleshy bearded lips; temporal muscles very large, only covered with skin. Skull very much depressed. Lower jaw very slender, weak.
2. **HYDRASPIDIDÆ.** Head depressed, covered with soft skin, sometimes divided into numerous polygonal plates not fringed. Skull depressed, with a distinct central crown, with a more or less strong or high occipital arch.
3. **PELOMEDUSIDÆ.** The head depressed, covered with hard bony plates, with a distinct, moderately developed zygomatic arch. Temporal muscles covered with hard dermal shields.
4. **PELTOCEPHALIDÆ.** Head very large, swollen, covered with hard bony symmetrical plates. Skull very strong; zygomatic arch much dilated, covering the temporal muscles.

Fam. I. CHELYDIDÆ.

Head very much depressed, covered with a soft skin, which is sometimes more or less divided on the surface into numerous polygonal plates. The beak covered with flesh or bearded lips. The skull very much abnormal, depressed, without any or only a very rudimentary zygomatic arch. Temporal depression large, with none or only a very slender bony arch at the back, from the ear-bones to the middle of the occiput; the temporal muscles only covered with a skin. Lower jaw very slender and weak, broad and wider in front. The alveolar surface of the jaws thin, with a more or less distinct submarginal ridge.—S. America and Australia.

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1. CHELYS.

Chelys, *Daud.*
Gray, Cat. Sh. Rept. 60; *P. Z. S.* 1864, p. 129.
Matamata, *Merrem.*

1. Chelys matamata. B.M.

Chelys matamata, *Gray, Cat. Sh. Rept.* 60; *P. Z. S.* 1864, 129.

Skeleton in Mus. Coll. Surg. no. 960, described by Owen, Cat. p. 187. Figured in Wagler's N. S. Amph. t. 3. f. 5, 15. Skull figured in Cuvier's Oss. Foss. v. 2, t. 11. f. 21–25, t. 12. f. 41.

Fam. II. HYDRASPIDIDÆ.

Head depressed, covered with skin divided into small polygonal scales. Beak naked. Chin sometimes bearded. Skull depressed, without any or only rudimentary zygomatic arches, but with a distinct central bony crown and a more or less strong aurioccipital arch. Lower jaw weak. The temporal depressions very large, covered with skin, separated by a very narrow leaf-like crown.

Australia.	Occipital arch	S. America.
Chelodina.....	.... weak	Hydraspis. Hydromedusa.
Chelymys ..... Elseya	.... strong	Platemys.

Synopsis of the Genera.

* *Skull slight; crown narrow, elongate; aurioccipital arch rudimentary and imperfect.*

1. **Chelodina.** Lower jaw very slender. Chin not bearded. Intergular plate within the margin of the sternum.

** *Skull slight; crown narrow, elongate; aurioccipital arch very weak. Thorax very depressed and thin.*

2. **Hydromedusa.** Chin not bearded. Nuchal plate long, like a vertebral, and within the margin of the thorax; intergular marginal.

Palæaspis.

3. **Hydraspis.** Chin two-bearded. Intergular and nuchal plates on the margin.

*** *Skull bony, solid; crown broad and square; the aurioccipital arch broad; the temporal depression moderate, covered with skin.*

4. **Platemys.** Thorax depressed; cavity wide. Chin with two beards.

5. **Chelymys.** Thorax convex, solid; cavity contracted at each end. Chin not bearded.

6. **Elseya.** Thorax convex, expanded. Nuchal shield none. The front cavity rather contracted. Chin bearded.

Megasternon.

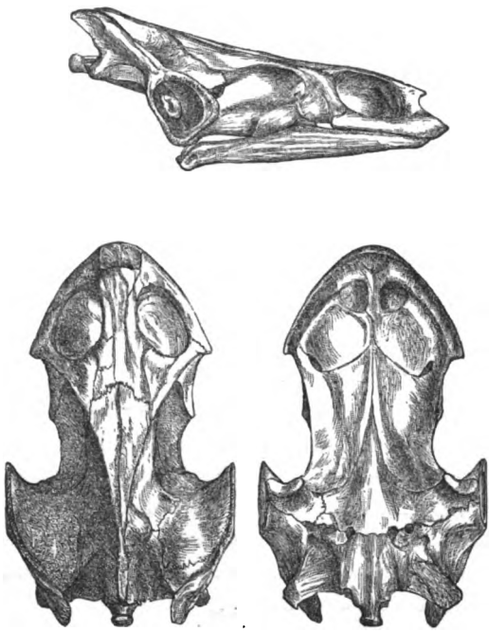
* *Skull slight; crown narrow, elongate; occipital arch rudimentary and imperfect.*

1. CHELODINA.

Intergular plate within the margin of the sternum. Chin not bearded.

Skull much depressed; the aurioccipital arch interrupted, not united to the central crest, and forming only a short process over the tympanic bone. Lower jaw very slender.

Fig. 23.



Chelodina Collisi.

Chelodina, *Gray, Cat. Sh. Rept.* 58; *P. Z. S.* 1864, p. 131.

Hab. Australia.

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† *Sternum narrow in front; shields very thin and veined.*

1. Chelodina Colliei. (Fig. 23.) B.M.

Chelodina Colliei, *Gray, Cat. Sh. Rept.* 59; *P. Z. S.* 1855, p. 200.

Skull very depressed, broad behind, rather angular in front; orbit large, shelving; forehead and crown elongate, flat, tapering behind; zygomatic arch none; ear-lobe rather produced, oblong, with a very long posterior process produced and expanded above, but without any process on the inner side to unite it to the central part of the occipital end of the crown; auriocipital arch imperfect. Palate flat; alveolar surface narrow, smooth; the lower jaw very slender, nearly semicircular in front, with a narrow, short outer edge and a scarcely elevated conical ramus.

2. Chelodina oblonga. B.M.

Chelodina oblonga, *Gray, Cat. Sh. Rept.* 58, t. 24; *P. Z. S.* 1864, p. 131.

Hab. North and West Australia.

3. Chelodina expansa. B.M.

Nuchal broad, flat; first vertebral shield large, equal, six-sided; under margin of the shell pale, with triangular, narrow, black, anterior streaks.

Chelodina expansa, *Gray, P.Z.S.* 1856, p. 370, t. 12; 1870, t. ined.

Hab. Australia.

Shell oblong, rather depressed, broader behind, brown; plates thin, with short, narrow inosculating grooves; the margins flattened, expanded; the sides of the back regularly convex; the lateral marginal plates rather broad, not revolute. The sternum flat, bluntly keeled on the sides, yellow. Head, neck, and limbs dark olive above; chin, throat, and underside of the limbs whitish.

Shell, length 11 inches, breadth 8 inches. Neck 8 inches long.

The young shell is like the adult; but the lateral margins are slightly revolute on the edges, though the plates are broad like the adult. The underside of the margin yellow, with a triangular black spot on the front edge of each shield; the dorsal shield thin, with three distant concentric grooves, with a rather rugose, moderate-sized areola; the areola of the costal plates subcentral; the areola of the first ventral plate is subcentral, of the second, third, fourth, and fifth vertebral plates it is on the middle of the hinder margin; the areola of the marginal plates is on the hinder outer margin. The front vertebral shield is large, and as broad as long; the others are much broader than long, the third being the shortest. This species differs from *Chelodina longicollis*, *C. oblonga*, and *C. Colliei* in the generally expanded form, and especially in the breadth and non-revolution of the lateral margin, and in the sides of the sternum not being so sharply keeled as in the two latter species.

It differs from *Chelodina sulcata* in the membranous character of the shields, and also in the sternum being narrow in front like that of *C. oblonga* and *C. Colliei*, and not expanded and broader as in *C. longicollis* and *C. sulcata*.—*Gray, P. Z. S.* 1856, p. 370.

†† *Sternum broad, oval in front; shields of disk very thin, veined.*

4. Chelodina longicollis. B.M.

Chelodina longicollis, *Gray, Cat. Sh. Rept.* 58; *P. Z. S.* 1856, p. 370; 1861, p. 57; 1864, p. 131.

Skeleton in Mus. Col. Surg. (no. 961). Shortly noticed by Owen (Cat. Osteol. p. 187).

"Feeds on young slender blades of grass."—*P. Z. S.* 1861, p. 59.

Hab. New Holland.

A fine shell of the adult animal of this species, larger than any I have hitherto received, was in the collection (Mr. Stutchbury's). The shell is rather convex and swollen on the sides, with a deep, broad, rounded concavity along the centre of the second, third, and fourth vertebral plates, about two-thirds the width of the plates. The black sutural lines on the sternum are narrow and uniform.

Length of the shell 8½, width 6 inches.—*Gray, P. Z. S.* 1856, p. 370.

††† *Sternum broad, oval in front; shields of thorax hard, horny.*

5. Chelodina sulcata. B.M.

Chelodina sulcata, *Gray, P. Z. S.* 1855, p. 201; 1864, p. 131.

C. sulcifera, *Gray, P. Z. S.* 1856, p. 370; *Cat. Sh. Rept.* p. 59.

Hab. Australia.

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** *Skull slight; crown narrow, elongate; the auriоccipital arch very weak; thorax depressed and thin.*—America and Australia. Hydraspidina, *Gray, P. Z. S.* 1864.

2. HYDROMEDUSA.

Nuchal plate long, like a vertebral, and within the margin of the thorax. Intergular marginal. Chin not bearded.

Hydromedusa, *Gray, Cat. Sh. Rept.* 59; *P. Z. S.* 1864, p. 131.

Hab. Tropical America.

† *Back nodose behind.*

1. Hydromedusa Maximiliani. B.M.

Hydromedusa Maximiliani, *Gray, Cat. Sh. Rept.* 59; *P. Z. S.* 1864, p. 131.

Skull on skeleton figured in Wagler's 'N. S. Amph.' t. 3. f. 25–42. Crown of skull elongate, narrowed behind; orbits large, superior, anterior.

†† *Back with central keel, rounded behind; shields grooved.*

2. Hydromedusa flavilabris. B.M.

Hydromedusa flavilabris, *Gray, Cat. Sh. Rept.* 59.

3. Hydromedusa Bankæ.

H. Bankæ, *Giebel, Zeitschrift für ges. Natur.* 1868, p. 19, t. 4.

Hab. Island of Banka.

Very like a South-American *Hydromedusa*; can the habitat be a mistake?

††† *The back not keeled, rounded behind.*

4. Hydromedusa depressa. B.M.

Hydromedusa depressa, *Gray, Cat. Sh. Rept.* 60, t. 26.
H. subdepressa, *Gray, P. Z. S.* 1852, p. 133.

5. Hydromedusa tectifera.

Anterior portion of the carapace depressed and prolonged; the first vertebral scutum nearly twice as long as broad; the nuchal scutum narrow, transverse, twice as broad as the first vertebral, four times as wide as long. Light brown, with slightly radiating or slightly transverse darker spots on the costal plates, below bright yellow.

Hydromedusa tectifera, *Cope, Proc. Am. Phil. Soc.* 1869, p. 147.

Hab. Parana or Uruguay River?

PALÆASPIS.

Shell depressed; nuchal shield large and quadrangular, included within the anterior marginal shield. First vertebral shield very small, oblong, and transverse, at the hinder base of the nuchal; second and third vertebral hexangular, as long as broad. Sternum broad, truncated in front and notched behind, transversely concave in the middle and bent up at the ends.

1. Palæaspis Conybearii.

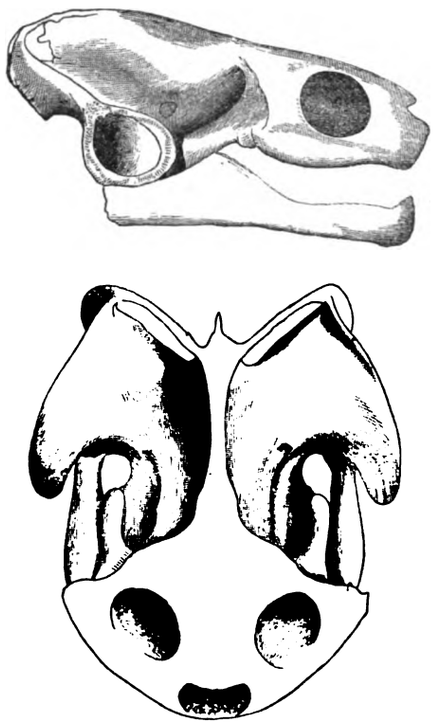
Emys Conybearii, *Owen, Foss. Rept. London Clay*, 77, t. xiii. & xiv.

Hab. Sheppey, London clay (fossil).

3. HYDRASPIS.

Intergular and nuchal plates on the margin. Chin two-bearded. Auriоccipital arch distinct.

Fig. 24.



Skull of *Hydraspis raniceps.*

Hydraspis, *Gray, Cat. Sh. Rept.* 54; *P. Z. S.* 1864, p. 129.

Hab. Tropical America.

The species of this genus are very imperfectly known,

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owing to the want of more specimens of the animals in different states of growth, some having been established from adult, but the chief from only young examples. I am convinced that they cannot be determined with accuracy until the osteology of the different species has been compared in the different states of growth.

† *Head very large, depressed, with small tesseræ.*

1. Hydraspis raniceps. B.M.

Hydraspis raniceps, *Gray, Cat. Sh. Rept.* 55, t. 23; *P. Z. S.* 1864, p. 129.

Hab. Brazil.

Skeleton in British Museum.

†† *Head moderate; crown subshielded.* Rhinemys.

2. Hydraspis gibba. B.M.

Rhinemys, sp., *Wagler, Syst.* 1830, p. 134.
Hydraspis gibba, *Gray, Cat. Sh. Rept.* 55; *P. Z. S.* 1864, p. 130.
Dum. et Bib. Erp. Gén. t. 20. f. 2.
H. nasuta, *Gray, Cat. Sh. Rept.* 55.

Hab. S. America.

H. nasuta is probably the young of *H. gibba*.

See also 1. Hydraspis Wagleri, *Gray, Cat. Sh. Rept.* 56.
2. H. rufipes, *Gray, Cat. Sh. Rept.* 56.
3. H. Miliusii, *Gray, Cat. Sh. Rept.* 56.

3. Hydraspis depressa. B.M.

Hydraspis depressa, *Gray, Cat. Sh. Rept.* 56.
See also Hydraspis radiolata, *Gray, Cat. Sh. Rept.* 56.

Probably a variety of the above. Only known from young specimens.

See also Hydraspis Bellii, *Gray, Cat. Sh. Rept.* 56.
H. Gaudichaudi, *Gray, Cat. Sh. Rept.* 56.
H. Hilairii, *Gray, Cat. Sh. Rept.* 56.

All only known from young specimens.

4. Hydraspis Spixii.

Hydraspis Spixii, *Gray, Cat. Sh. Rept.* 54; *P. Z. S.* 1852, p. 134.

††† *Head moderate; occipital and superciliary shields enlarged.* Phrynops.

5. Hydraspis Geoffroyana.

Hydraspis Geoffroyana, *Gray, Cat. Sh. Rept.* 57; *P. Z. S.* 1864, p. 130.
Phrynops Geoffroyana, *Wagler, N. S. Amph.* t. 5. f. 47–51.
Platemys Geoffroyana, *Ansell, Wieg. Archiv*, 1868, p. 50.

6. Hydraspis Gordoni.

Head rather large, crown flattish, with numerous small, flat, polygonal plates, those on the middle of the crown more or less united together, or only separated from one another by short lines of dots, with an arched sunken line over each eye. The shields on the hinder part of the head longer and more separate. The temple covered with distinct convex plates, separated from each other by well-marked grooves, those over the tympanum small, less distinct, and forming an arched series. Chin and throat covered with small acute plates; chin two-bearded. The sheath of the lower jaw whitish. The shell depressed, dark brown, shelving to the front edge, and slightly bent up on the side edge. The nuchal shield narrow, elongate. The first vertebral shield the largest, nearly square, four-sided, but rather narrower behind; second and third similar, small, with a small process on the middle of each side; the fourth narrower, elongate, nearly twice as long as wide. Sternum and lower side of the margin white. Intergular shield broad, rather longer than wide; the anal notch large, semicircular. The animal blackish; chin, throat, and underside of limbs near axilla and groin whitish.

Hydraspis Gordoni, *Gray, P. Z. S.* 1868, p. 563, t. 42.

Hab. Trinidad, near the mountain of Tamana (*Hon. Arthur Gordon*).

The Tortoise is like *Elseya latisternum* in general appearance; but that animal has no nuchal shield, the anal end of the sternum is truncated and only slightly angularly bent in the middle, and the animal has a distinct white streak on each side of its neck, and the shields over the temples are flatter. The large broad scales on the under outer side of the hind legs are more equal, those near the toes being high and conical; and the nose is longer, more conical, and produced.

Some living Tortoises belonging to the Zoological Society's collection have been brought to the British Museum to be determined and named—among them an *Hydraspis* (deposited in the Society's Gardens in July by the Hon. Arthur

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Gordon, Governor of Trinidad) which I have not seen before, and which is not in the Museum collection, at least in the adult state. It is the first species of the genus that has been brought from the West-India islands; all the others are from the American continent. It is very distinct from all that I have seen in the adult condition, but it may be only an adult specimen of a species that has been described from a very young animal; for, unfortunately, as I observed in my paper on the family in 1864, the species have been described from adult specimens and from very young ones, and it is impossible to determine whether some of these presumed species may not be young states of some that have been described under different names, and *vice versâ*.

It is so uncommon to obtain a specimen alive and in an adult state, that I think it had better be described and figured, even with the disadvantage that one may be adding another synonym to the list.

7. Hydraspis tuberosa.

Shell high, keeled; above brown, with a white margin; beneath white, with irregular black bands; vertebral and costal plates tubercularly keeled; head with numerous small shields.

Platemys Hilarii, *Trosch. Schomburgk, Reisen in Britisch Guiana*, iii. 647 (*non Duméril et Bibron*).
P. tuberosa, *Peters, Monatsbericht d. Akad. Berlin*, 1870, p. 311, t. i. & ii.

Hab. British Guiana.

*** *The skull solid; crown broad, square; the auri-occipital arch broad.*

4. PLATEMYS.

Thorax depressed, light; cavity wide. Crown of head with a continuous skin; temple scaly; skull rather slight; crown flat, broad, as wide behind as in front; orbits anterior, subsuperior, moderate; forehead broad, nearly flat. Palate broad, short (Wagler, Syst. Amph. t. 2. f. 6–10). Chin two-bearded. Legs with large scales.

Hab. Tropical America.

Platemys, *Wagler*.
Gray, Cat. Sh. Rept. 53.

1. Platemys planiceps. B.M.

Platemys planiceps, *Gray, Cat. Sh. Rept.* 54; *P. Z. S.* 1864, p. 131.

Skeleton figured in Wagler's N. S. Amph. t. 4. f. 45; shell, f. 6–10.

A skeleton in the British Museum (without the sternum); the skull is thin; palate flat, broad; internal nostrils quite in front of the palate, in a slanting depression, without any peculiar depression behind them; alveolar surface narrow, linear; lower jaw slender.

A half-grown specimen in spirits, obtained by Mr. Bartlett, Junior, from Surinam. The animal is black; the top of the head bright yellow, with a large central blackish-brown spot on the hinder part of the crown.

5. CHELYMYS.

Thorax convex, solid; cavity contracted and strengthened by two erect bony folds in front. Crown of head with numerous polygonal tesseræ. Skull solid. Chin not bearded. Legs with small scales. Nuchal shield broad, well developed. Hinder edge of the shell entire.

Hab. Australia.

Chelymys, *Gray, Cat. Sh. Rept.* 57; *P. Z. S.* 1864, p. 131.

"In establishing this genus (*Chelymys*) the only species then known had a distinct nuchal plate, and the existence of this plate is made part of the generic character. We have since received two specimens of the shell of a Tortoise without the animals, which has all the other characters and appearance of the genus, but is destitute of the nuchal shield; so I am inclined to amend the generic characters by leaving out this particular, and to use the presence or non-existence of the nuchal shield as a sectional or specific character; and we have received other specimens of the species with the nuchal shield, which have further illustrated the species, and show that this shield is always present in it."—*Gray, Ann. & Mag. N. H.* xii. 98.

I have since formed it into a genus.

1. Chelymys macquaria. B.M.

Chelymys Macquaria, *Gray, Cat. Sh. Rept.* 57; *Ann. & Mag. N. H.* 1863, xii. 98; *P. Z. S.* 1856, p. 371, 1864, p. 132.

"Two adult specimens of this kind were also in the series (Stutchbury's, from Australia). They are both much darker than the two specimens in the British-Museum collection. They are also peculiar for having a very distinct,

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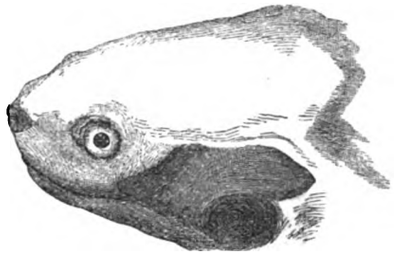
deep, narrow, interrupted groove along the vertebral line, deepest and widest on the fourth vertebral plate. The discal shields are also marked with rather deep, distinct,

Fig. 25.



Chelymys macquaria.

radiating grooves, which are evidently indentations in the bones of the animal, only covered by the very thin skin-like shields.

"Shell, length 11, breadth 8 inches."—*Gray, P. Z. S.* 1856, p. 371.

"This animal presents two varieties, differing in the height of the back and the width of the hinder marginal shields. Specimens brought by the same collectors, probably from the same locality, offer considerable variation in this respect, and appear to form a series of gradations from one variety to the other. The higher and more solid specimens are of the smallest size; but we have very depressed broad margins in the young specimens as well as in the more adult ones, the latter being twice the size.

"The solid, higher varieties may be only of different sexes, or they may even prove to be species when more is known of their habitation and habits; indeed I should be inclined to consider them so now, if we had not received both varieties from Capt. W. Chambers and Mr. Cuming as coming from the same locality. They vary considerably in the form of the gular shield: in the small, solid, high-shelled varieties it is broad and short; in some of the older of the larger depressed specimens it is equally short and broad; in the younger depressed specimens it is narrow, linear, elongate."—*Gray, Ann. & Mag. N. H.* 1863, xii. 98.

6. ELSEYA.

Nose and crown of the head covered with a smooth skin. Temple, cheek, and throat covered with flat polygonal plates. Tympanum flat. Chin two-bearded. Upperside of the neck warty. Shell convex, expanded and subdentate behind, sides slightly revolute; nuchal shield none; front of the cavity rather contracted. Vertebral column short, keeled within; sternum solid, rather narrow, with shelving side-wings; gular shields elongate, small, marginal. Tail short, thick, concave. Claws 5.4, acute.

Hab. Australia.

Elseya, *Gray, Ann. & Mag. N. H.* 1867, xx. p. 44.
Chelymys, § **, *Gray, Ann. & Mag. N. H.* 1863, xii. p. 98.

"This genus is particularly interesting (as forming a passage between the *Hydraspides* of Australia and South America) in having a pair of beards in the front of the chin, a warty upper surface to the neck, and scaly temples—all characters absent in most of the Australian species, but generally present in those genera of the families peculiar to South America.

"They thus combine with the habit and structure of the Australian genera some of the technical characters of the South American."—*Gray, Ann. & Mag. N. H.* 1867, xx. 43.

Named after my late friend, who lost his life in attempting to increase our knowledge of the zoological productions of Australia.

1. Elseya dentata. B.M.

The front of the sternum narrow, half-ovate, with the sides rapidly contracted in front; the gular shields very narrow, elongate.

Chelymys dentata, *Gray, Ann. & Mag. N. H.* 1863, xii. 98, 246; *P. Z. S.* 1864.
C. elseya, *Gray, MSS. B.M.*
Elseya dentata, *Gray, Ann. & Mag. N. H.* 1867, xx. p. 44.

Hab. North Australia, Upper Victoria, in Beagle's valley (*Dr. Elsey*).

There is a series of three shells of this species in the British Museum, young, middle-aged, and adult. The plates of the under surface of the two younger specimens are pale, and do not appear to have a dark edge, as is the case with the two half-grown specimens of the next species. The adult shell is black-brown above and below, varied with pale brown on the middle of the sternum.

"Shell ovate, wider behind; hinder margin dentated; side edge revolute. Nuchal shield none. Back with a slight nodule at the hinder part of the vertebral shields. The first vertebral shield broader than long, the rest longer than broad; the fourth the longest, rather urn-shaped, the margin shelving.

"Younger shell:—Back slightly keeled; the margin more expanded, nearly horizontal; the vertebral plates broader than long; the fourth the largest, with five even sides.

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"Native name, 'Billymurry.' It was caught with grasshoppers; and the stomach contained *Pandanus*-seeds.

"The gular shield in both the specimens is narrow, elongate, extending down between the front edge of the second pair of sternal shields.

"This species is at once known from the former by the form of the nodular keel on the vertebral plates, and by the dentated hinder margin, as well as by the absence of the nuchal shield.

"An adult specimen brought from the same locality at the same time, which is doubtless the adult of this species, proves that the dentated form of the margin is only a peculiarity of the younger state of the species; and therefore the specific name is not one that I should have chosen if I had had the adult form of the species before me when I selected it. But as the margin is not dentated in the young of the other species, it is still characteristic. The species is easily known from the other, both in its adult and young state, by the absence of the nuchal plate. The adult shell is oblong-ovate, solid and high; the back is worn smooth; and the margin is entire, the edge over the legs being rather expanded, and the hinder part over the tail rather inflexed; the vertebral plates are very long, slender, with straight parallel sides, nearly twice as long as they are wide; the hinder part of the fourth shield is rather narrowed. The sternum is narrow, rounded in front, and with a deep semicircular notch behind, high on the sides. The underside is black, with a few unequal-sized yellow blotches. The length is 13 inches; width over the back 10½ inches."—*Gray, Ann. & Mag. N. H.* 1863, xii. 98, 246.

2. Elseya latisternum. B.M.

The front lobe of the sternum broad, nearly semicircular in front; the gular shield as broad as the side shield, and rather short; the plate on the under surface yellow, with narrow dark edges to the shields; hinder margin of the shell dentated.

Elseya latisternum, *Gray, Ann. & Mag. N. H.* July 1867.

Hab. North Australia.

There are two specimens of this species in the Museum; they are at once known from *E. dentata* by the greater comparative breadth of the sternum, which is most marked in the form of the front lobe, though common to all its parts.

The shells of the two specimens vary considerably in form, one being much broader compared with the length than the other; and also, on the surface, one has the shields of the back of the shell nearly smooth, and the other covered with close sunken dots.

The animal is dark slate-coloured above, and paler grey beneath. There is a broad well-marked white streak from the hinder angle of the mouth, margining the underside of the tympanum and extending nearly to the middle of the base of the front legs; the hind legs have a series of rather large prominent scales from the outer side of the knee to the base of the outer toes, which are largest near the toes; tail short, with two series of shields on the underside, behind the vent.

MEGASTERNON.

Sternum very broad, flat, rounded in front, narrowed and slightly notched behind. Intergular shields (a pair) quadrangular.

Megasternon, *Gray, Cat. Tort. & Croc. B. M.* 45.
Platemys, sp., *Owen.*

1. Megasternon Kœnigi. B.M.

Megasternon Kœnigi, *Gray, Cat. Tort. B. M.* 1844, p. 45; *Syn. B. M.* 1840.
Platemys Bullockii, *Owen, Foss. Rept. London Clay*, pl. 1. 21.

Hab. Sheppey, London Clay (fossil).

"Sternum flat, rounded at each end, having a sterno-costal suture covered with several plates like *Platisternon* and *Dermatochelys*. Fossil from the Isle of Sheppey in Brit. Mus." (Gray, Synop. B.M.)

According to Prof. Owen's descriptions, what I took for indications of additional sterno-marginal shields are only sutures of the bones; but at any rate it was the first indication of the existence of a fossil Hydraspide. The other fossil species named *Platemys* does not belong to this genus.

Fam. III. PELOMEDUSIDÆ.

Head depressed, covered with hard, symmetrical horny plates, generally with a deep longitudinal frontal groove. The skull depressed. Zygomatic arch moderately developed. Temporal muscles covered with hard dermal shields. Alveolar surface of the jaws thin, with a small submarginal ridge. Lower jaw strong. Beak naked. Nuchal and gular plate marginal. Claws 5.5.—Africa.

Emydoid Chelydidæ, *Gray, P. Z. S.* 1864.
Chelydidæ, sect. *a*, *Gray, Cat. Shield Rept.* 51.

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SYNOPSIS OF THE GENERA.

1. **Sternothærus.** Nose with a longitudinal groove. Front lobe of the sternum mobile, with an internal process on each side.

2. **Pelomedusa.** Nose with a longitudinal groove. Sternal lobes solid.

3. **Dumerilia.** Nose not grooved.

1. STERNOTHÆRUS.

Front lobe of sternum mobile, with an internal process on each side.

Sternothærus, *Gray, Cat. Sh. Rept.* 51; *P. Z. S.* 1863, p. 192, 1864, p. 132.

Hab. Africa and Madagascar.

According to Cope has ten bones in its plastrum instead of eight (Proc. Acad. Nat. Scien. Phil. 1868, p. 119).

The shell or thorax of the *Sternothæri* offer such different appearances, according to the age or other special conditions under which they have lived, that it is almost impossible to distinguish them; and the more specimens are received, the greater becomes the difficulty. Under these circumstances, as the heads seem to present some characters which, as far as I have been able to observe them in the limited number of specimens which have come under my examination, seem permanent, I have attempted to define the peculiarities presented by the heads of the specimens in the Museum collection from different localities. The species were so difficult to distinguish by means of the shell only, that, in my 'Catalogue of Shield Reptiles in the British Museum,' I stated that all the species there noticed "perhaps may prove only to be varieties of the same species, or dependent on age" (p. 52).

A larger series of specimens from the same localities has shown that such characters as the shape and thickness of the shields, and especially of the first vertebral shield, which have been hitherto to some extent depended on for the separation of the species, are very variable. Therefore the discovery of some other more permanent characters seems important; and the form and disposition of the shields on the head appear to furnish such characters.

Mr. Cope observes that *S. Derbianus* differs from *S. sinuatus* of Smith "mainly in the form of the upper mandible, which is obtusely hooked in the former, bidentate in the latter." I suspect he must have been misled in these observations by figures or descriptions; for the jaws of the typical specimens of the two species are very similar.

It will be necessary to separate the genus into three sections, according to the form of the head, premising that I only know the species belonging to the third section from the descriptions of MM. Duméril and Bibron, as all the specimens that have come under my observation belong to the first or second sections. These sections may be thus characterized:—

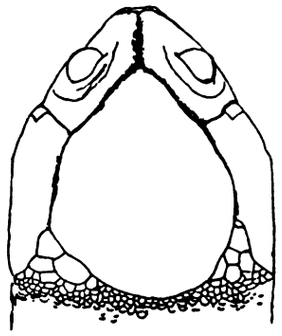
Section I. *Head short and broad; the upper jaw obscurely notched and bidentate in front; the crown shielded to a line even with the back of the tympanum.* Tanoa.

Tanoa, *Gray, P. Z. S.* 1863.

1. Sternothærus sinuatus. B.M.

Head rather broad, depressed; jaws pale; the temporal plate broad and short, only reaching to the front of the tympanum, and with another rather smaller similar plate behind it over the ear; the hinder vertebral plate of the adult as wide as long, not tubercular; the fore legs with small scales, and with some very wide, slender, band-like shields on the inner side of the upper surface; the sternum with a narrow deep notch behind.

Fig. 26.



Head of *Sternothærus sinuatus.*

Sternothærus castaneus (part.), *Gray, Cat. Sh. Rept.* 52.
S. sinuatus, *A. Smith, S. African Zool.* t.
Gray, P. Z. S. 1863 (fig. of head), 1864, p. 132.

Hab. S. Africa, Natal (*Dr. Krauss*).

In other specimens the front marginal shields are rather

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wide, the middle one as long as broad; the front vertebral shield is elongate, with straight sides.

It is better to retain the name given by Dr. Andrew Smith to the Natal specimen for this species, as it is very doubtful to which of the specimens the *Emys castanea* of Schweigger is referable, and one of the specimens described in the Catalogue as *S. castaneus* is certainly *S. Derbianus*.

2. Sternothærus Derbianus. B.M.

The head very broad, depressed; jaw dark, black-lined; the temporal plate single, broad and long, reaching to the back of the tympanum; the upper surface of the front leg with moderate-sized scales, and with many larger, convex band-scales on the inner side; the hinder edge of the fourth and the upper edge of the fifth vertebral plate tubercular; the sternum with a deep rounded notch behind; the vertebral plate of the adult longer than broad.

Pentonyx gaboonensis, *A. Duméril, Arch. du Mus.* x. p. 164, t. 23. f. 2 (young).
Sternothærus Derbianus, *Gray, P. Z. S.* 1863, p. 192, 1864, p. 132; *Cat. Sh. Rept.* 52, t. 22.
Cope, Proc. Acad. N. S. Phil. 1859, p. 244.

Hab. W. Africa; Gaboon; Sierra Leone.

The British-Museum specimens offer several varieties, thus:—

1. Front marginal plates thick, convex, broader than long; the front vertebral shield elongate urn-shaped.

2. Front marginal plates as long as broad, flat; the front vertebral shield elongate urn-shaped.

3. Front marginal plates as long as broad, flat; the front vertebral shield elongate, with straight sides.

In one specimen of the first variety the vertebral shields are much narrower than the other.

The shield on the crown of the head in the two specimens which have heads is more or less perfectly divided into three shields, viz. one frontal and two occipital; but together they cover the whole top of the head to a line with the back of the ears, and there are only a few small shields between the hinder side of the hinder part of it and the back edge of the temporal shields.

I think there can be very little doubt that the specimen which M. Aubrey Lecomte sent to the Paris Museum from the Gaboon, and which M. Auguste Duméril, in his very hasty and very incomplete and inaccurate paper "On the Reptiles of Western Africa," in the 'Archives du Muséum' (vol. x. p. 165), has described and figured under the name of *Pentonyx gaboonensis*, is only the young state of this species. One is surprised that a herpetologist who must have unrivalled opportunities of study should not have been led by the breadth of the lobes of the sternum to doubt its being a *Pentonyx*. However, it is well, as it gives their museum a representative of a species which they did not formerly possess. But, what is more extraordinary still, M. A. Duméril, who is so ready with and so bitter in his observations on the works of others, though this figure shows that the horny plates consist almost entirely of the areolæ of the large shields, with only two or three rings of deposit round them, showing that the animal could not long have been hatched, yet observes, "L'aspect de la carapace et sa solidité comparée à celle de la boîte osseuse de jeunes *Pentonyx* du Cap semblent prouver que notre individu est adulte" (p. 164). The example figured must be that on which this observation is founded; for he observes, "Il est unique dans la collection."

It is probable that *Emys Adansonii* of Schweigger, the *Pentonyx*, and more lately the *Sternothærus Adansonii* of Duméril and Bibron, described from a shell in the Paris Museum said to have come from Cape Verd, is probably only a half-grown specimen of this species, which is the only *Sternothærus* I have seen from Western Africa.

The specimen in the British Museum from Sierra Leone, which is described in the 'Catalogue of Shield Reptiles' (p. 52) as *Sternothærus castaneus*, appears to belong to this species.

Section II. *The head rather short and broad; the upper jaw truncated; the crown covered with an oblong shield (or three smaller shields), with a number of smaller shields over the tympanum, between the hinder outer edge of the crown-plate and the upper edge of the large temporal shields.* Notoa.

Notoa, *Gray, P. Z. S.* 1863.

3. Sternothærus subniger. B.M.

Head depressed; jaws pale; the upper surface of the fore legs with small scales, and a few rather larger ones on the inner sides.

Sternothærus castaneus, *Dum. et Bibr. Erp. Gén.* ii. p. 401, t. 20. f. 1.
S. subniger, *Gray, P. Z. S.* 1863 (fig. of head), 1864, p. 133.

Hab. Madagascar.

The specimen in the British Museum, which was received from Paris under the above name and as coming from Ma-

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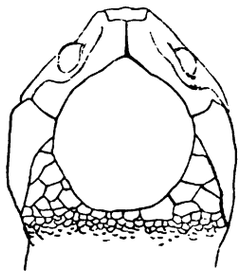
dagascar, agrees well with Duméril and Bibron's description and figure; but they do not describe the small shields on the head, and especially say that the frontal plate is much developed, and that there are no occipital plates. Now in our specimen the sutures of the occipital plates are well

Fig. 27.



Head of *Sternothærus subniger*.

seen, and they are peculiar for being oblong and obliquely placed (so as to leave the sides of the occiput to be covered with small shields), instead of being large and trigonal (as they are in the two other species) and covering all the space on the head to the margin of the temporal shields.

4. Sternothærus Adansonii. B.M.

Shell oblong ovate, depressed, rather wider behind than in front; dark olive, with very close, regular, uniform, radiating black lines, sometimes broken up into small dark spots; sternum and underside of the margin yellow; the areola of the sternal plate square, blackish.

The head depressed, with very close, nearly uniform, unequal black lines; the frontal plate very large, with a triangular patch of small scales on the temple, reaching to over the front edge of the ears; the lips white; the throat pale; the feet olive above, pale beneath; claws 5.5, olive, with a yellow streak in the middle of the upper surface.

The first vertebral plate much longer than wide, narrow behind, with a blunt keel ending in a rounded tubercle behind. The second, third, and fourth vertebrals about as wide as long, with a sharp keel, ending in an acute tubercle near the hinder edge of each shield; the fifth vertebral like the first, but only very slightly keeled. The front marginal plate wide, those over the hinder legs rather wider, and those on the sides of the shell very narrow. The gular plates small, triangular; the intergular one lozenge-shaped, narrowed in front; the pectoral plates narrowed and truncated at the inner edges.

Sternothærus Adansonii, *Gray, Cat. Sh. Rept*, 52; *P. Z. S.* 1863, t. 23.
Duméril, Arch. du Mus. vi. 243, 247.

Hab. West coast of Africa (*Dalton*).

On the 20th of May 1863 I read a paper before this Society on the species of *Sternothæri* then in the British Museum, and I divided them into sections or subgenera. In that paper I took no notice of *Sternothærus Adansonii*, as that species was only described from a shell in the Paris Museum, said to have come from the Cape-Verd Islands, which had been noticed by Schweigger under the name of *Emys Adansonii*.

The British Museum have since received two specimens of a species of the genus from the west coast of Africa, collected by Dr. Baker, which is very distinct from any of the others, and, I have little doubt, is identical with the shell in the Paris Museum. As it is in a perfect state and well preserved, I think it well to give a new description of it.

The species belongs to the subgenus *Notoa*, the head being short, and the temples covered with a large triangular space of small polygonal shields.

The hinder part of the sternum of the animal is narrower, and more like that of the genus *Pelomedusa* than any of the other species of the genus *Sternothærus*; but the front lobe is distinctly moveable, and united by a straight suture.

Dr. Kirk has just presented to the British Museum a living specimen of a young *Sternothærus* from the river Shiré, near the Murchison Rapids in the Zambesi. It appears, from the small temporal shields, to be the young of *S. subniger*; but it differs so much from the adult specimens of that species as to be worthy to be described.

Shell oblong, rather shelving on the sides, with a sharp interrupted dorsal keel, more prominent and forming tubercles behind. It is blackish olive and black beneath, with a large central white blotch occupying the greater part of the sternum.

The dorsal and marginal shields have a rather large, rugose, subposterior areola, with very numerous regular radiating grooves, and a few distinct concentric grooves near the margin. The first vertebral shield is quadrangular, about as broad as long, and narrowed behind; the second, third, and fourth are hexagonal, the second rather broader than long, and the fourth longer than broad; the second has a very blunt keel, occupying its hinder half; the third and fourth are sharply keeled, the keel being prominent near the hinder edge, especially of the fourth shield; the

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fifth shield four-sided, much contracted in front, and with a slightly raised sharp central keel.

The margin is very narrow on the sides, wider and sharper-edged in front, wide and rather arched over the hinder legs, rather narrow and very strongly dentated behind. The sternal shields are like the dorsal ones, radiately and concentrically striated, but not so strongly. The head is olive, black-speckled above, beneath pale yellowish, darker-marbled on the sides; the legs and feet are uniform brown, covered with small scales, the front ones with two broad band-like scales just over the feet; the toes are united together to the end; the claws are narrow and sharp.

Length 3½, breadth 3 inches.—*Gray, Ann. & Mag. N. H.* 1863, xii. 405.

Section III. *Head elongate; upper jaw with a recurved crown, with a moderate beak, frontal, two long nasal, and two large parietal plates.* Anota.

Anota, *Gray, P. Z. S.* 1863.

5. Sternothærus niger.

Sternothærus niger, *Dum. et Bibr. Erp. Gén.* ii. 597 (not t. 20. f. 1, as quoted).
Gray, P. Z. S. 1863, p. 196, & 1864, p. 133.

Hab. Madagascar (Mus. Paris?).

The species of this genus seem to have a confined range. Thus, of the two species of the first subgenus (*Tanoa*), one is from South Africa and Natal, and the other from Western Africa; in the same manner, of the two species of the second subgenus (*Notoa*), one is from Madagascar, and the other from the West-African coast. Thus

1. *Tanoa.*		2. *Notoa.*
S. sinuatus	S. and E. Africa....	*S. subniger.*
S. Derbianus ..	West Africa	*S. Adansonii.*

2. PELOMEDUSA.

Lobes of sternum solid, immoveable.

Pelomedusa, *Gray, Cat. Sh. Rept.* 52; *P. Z. S.* 1864, p. 133.

Hab. Africa.

"Skull like *Emys*."—Wagler.

* *Pectoral shields small, short, triangular; humeral large; occipital shields small.* Pentonyx.

Pentonyx, *Rüppell, Gray.*

1. Pelomedusa Gehafiæ. B.M.

Pelomedusa Gehafiæ, *Gray, Cat. Sh. Rept.* 53; *P. Z. S.* 1864, p. 133.
Duméril, Arch. du Mus. iv. 243.

A specimen of *Pelomedusa Gehafiæ* in spirits from the Upper Nile, obtained by Mr. Petherick. The head is brown, vermiculated with black; the dorsal shields brown, black-rayed.

** *Pectoral and humeral shields equal, oblong, four-sided; occiput largely shielded.* Pelomedusa.

2. Pelomedusa subrufa. B.M.

Shields smooth, or with only a few slight concentric grooves; lower margin uniform, pale.

Pelomedusa subrufa, *Gray, Cat. Sh. Rept.* 53; *P. Z. S.* 1864, p. 133.
Wagler, Syst. Amph. t. 2. f. (skull).
P. galeata, *Peters, Monatsbericht*, 1854, p. 286.

Skeleton of young specimen in British Museum:—The skull thin, depressed; palate flat; internal nostrils quite anterior, large, without any posterior convexity behind them; alveolar margin linear, with a submarginal groove on the upper jaw, and short inner edge; lower jaw linear, hinder part of the edge rather thickened, with a slight parallel groove; the pelvis is united to the sternum by a distinct bony symphysis in the young.

Hab. ——?

3. Pelomedusa nigra. B.M.

Shell closely annulated; lower margin black- and white-spotted.

Pelomedusa nigra, *Gray, Ann. & Mag. N. H.* 1863, xii. 99; *P. Z. S.* 1864, p. 133.
P. subrufa, var. 2, *Gray, Cat. Sh. Rept.* 53.
Pentonyx du cap, *A. Duméril, Arch. du Mus.* xiii. t. . f. 3.

Hab. Natal.

"Hitherto there have been only two species of *Pelomedusa* recorded—one from the Cape of Good Hope, which has long been known, and the other from Abyssinia, where it

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was discovered by Dr. Edward Rüppell; and they are so distinct from one another in the form of the ventral shield that each has been considered the type of a distinct subgenus, viz. *Pentonyx* and *Pelomedusa*. The British Museum received from Mr. Sargeant, the Commissioner for Natal in the International Exhibition, two specimens of the genus from Natal. They belong to the same subgenus, and are very like the species from the Cape; yet they seem to offer characters which mark them as distinct species, or at least very distinct local varieties.

"In the Cape species, or *Pelomedusa subrufa*, the head is moderate (but they seem to vary in its size, perhaps in the two sexes), and there are only a few small scales between the hinder outer edge of the crown shield and the upper edge of the temple-shield, and the front one of these scales is over the middle of the temple-shield. In the Natal species, which may be called *Pelomedusa nigra*, the head is larger and more depressed, and there are several scales between the outer hinder edge of the crown-shield and the temple-shield; and the front scale of the series is narrow, and in the front part of the suture near the orbit which separates these two shields.

"When I published the 'Catalogue of the Shield Reptiles' (1855, p. 53), I separated as a variety of *P. subrufa* a specimen which I had obtained from Mr. Warwick, thus:—'Black, grey-spotted; shields all with close, rather granular, radiating ridges and concentric grooves; areola small.'

"I am now informed that this specimen came from Natal; and in the above character it agrees with the two specimens received from Mr. Sargeant; while in all the specimens of *P. subrufa* which I have seen, the shell is more or less rufous brown, often very pale, and the shields are smooth, with only a few distant concentric narrow lines, or they are all over smooth as if worn and polished.

"The three Natal specimens agree also in the underside of the margin being black, with triangular white portions on the inner hinder edge of each shield, and the sternum is black or blackish brown. From the distribution of the colours I believe that the "*Pentonyx du cap*" figured by M. Auguste Duméril in the 'Archives du Muséum' is this species.

"I have no doubt of these being distinct species, not only on account of their colour, but also on account of the difference in the scales on the crown, which is very similar to the difference that separates the Natal from the Madagascar *Sternothærus*."—*Gray, Ann. & Mag. N. H.* 1863, xii. 99.

A specimen of *Pelomedusa* in spirit said to come from West Africa, collected by Dr. B. Baikie:—The pectoral shields are narrow on the central edge, very truncated. Shields pale yellow, with a red irregular-shaped spot on each areola; the lower margin uniform pale yellow; dorsal shields with narrow, black rays; crown regularly vermiculated with black like *P. Gehafiæ*.

3. DUMERILIA.

"Capite lato, depresso, non sulcato; oculis lateralibus; mandibula robusta, subuncinata, non denticulata. Scutis temporalibus magnis. Testa oblonga, curvata, retro depressa; scuto nuchali nullo. Pedibus maxime palmatis, anterioribus 5-, posterioribusque 4-cingulatis. Pelle nuda, tuberculis sparsa; duobus cirris brevibus sub mento; pedibus posterioribus squamis duabus magnis rotundatis. Cauda inunguiculata et superne cum squamis obliquis et lunaribus in geminata serie."

Dumerilia, *Grandidier, Rev. et Mag. Zool.* 1867, p. 233; *Zool. Record*, 1867, p. 132.

1. Dumerilia madagascariensis.

"Capite brunneo, aurantio-flavido vermiculato; callo pedibusque nigrescentibus. Testa supra brunnea minutissimis punctis aurantiis distincta, subtus rubro-brunnea, partito flava. Long. testæ $0^{m}{\cdot}35$."

Dumerilia madagascariensis, *Grandidier, l. c.*

Hab. Madagascar.

Fam. IV. PELTOCEPHALIDÆ.

Head large, swollen, covered with hard symmetrical bony plates; eyes superior, anterior. Sternal shields 13; gular shields marginal. Claws 5.4. Skull very solid; orbit simple, anterior. Zygomatic arches much dilated posteriorly, so as to cover the temporal muscles with a bony case to the occiput. Alveolar surface of the jaws wide, callous, with several ridges. Ear-bone very large. Lower jaw strong, angular in front.—South America.

Chelonoid Chelydidæ, *Gray, P. Z. S.* 1864.
Chelidydæ (part.), *Gray, Cat. Sh. Rept.* 50.

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SYNOPSIS OF THE GENERA.

1. **Podocnemis.** Head rather depressed; nose with a central groove. Alveolar surface of the upper jaw with three ridges.
2. **Chelonemys.** Head rather depressed; nose with a central groove. Alveolar surface of the upper jaw with two sharp ridges.
3. **Peltocephalus.** Head high; nose without any groove.

1. PODOCNEMIS.

Head subdepressed. Nose with a central groove. Temporal muscle partially covered with skin. Alveolar surface of the upper jaw with three ridges: the hinder broad, low, margining the edge of the inner nostrils; the two front sharp-edged, diverging to the end of the maxillary edge; the first one short. Head broad, short.

Podocnemis, *Gray, P. Z. S.* 1864, p. 133; *Cat. Sh. Rept.* 61.

1. Podocnemis expansa. B.M.

Podocnemis expansa, *Wagler, N. Syst. Amph.* t. 4.
Gray, Cat. Sh. Rept. 61, t. 27 (shell), t. 37. f. 1 (skull).
Silva Coutinho, Bull. Soc. Acclim. Paris, 1868, p. 156.
Emys quadripunctata, "from India," *Utrecht Mus.*

The highest part of the back at the suture between the second and third vertebral plates.

2. CHELONEMYS.

Head elongate, narrow, rather depressed. Nose with a central groove. Temporal muscle partly covered with skin. Alveolar surface of the upper jaw with two sharp edges; ridges parallel to the edge of the jaw and the opening of the inner nostrils; the hinder ridge thinnest, and nearly on the margin of the opening of the inner nostrils.

Chelonemys, *Gray, P. Z. S.* 1864, p. 131.

1. Chelonemys Dumeriliana. B.M.

Podocnemys Dumeriliana, *Duméril, Arch. du Mus.* vi. t. 18. figs. 3 & 4.
Wagler, N. Syst. Amph. 135.
Gray, Cat. Sh. Rept. 62, t. 28.
P. Lewyana, *Duméril, Arch. du Mus.* vi. t. 18 & 19.
Emys expansa, *Cuvier, Oss. Foss.* v. pt. 2. t. 11. f. 9–12 (skull), not *Dum. et Bibr.*

The highest part of the back at the hinder end of the third vertebral plate.

"The two species of *Podocnemis* are well distinguished by the shape of the dorsal disk, and by the smaller size and more elongated shape of the head of the animal in the second; but I am not aware that the distinction which exists between the two species in the structure of the skull has been before recorded.

"In the British Museum there are two skulls of each species, received from Mr. Bates, from Ega. And it is important to observe that the skull figured by Cuvier (Oss. Foss. vol. v. pt. 2. t. 11. f. 9–12) as *Emys expansa* is one species, and that figured by Wagler (N. Syst. Amph. t. 4) as *Podocnemis expansa*, and by me in the 'Catalogue of Shield Reptiles in the British Museum' (t. 37. f. 1), is the other.

"They are very similar externally; but the skulls of *P. expansa* are much larger and much broader, compared with their length, than those of *P. Dumeriliana*. The frontal plate of the latter species is much larger compared with the size of the head, and it is also longer and narrower than the same plate in *P. expansa*. The ridges on the alveolar surface of the upper jaws of the two species are very distinct; and this distinction seems permanent, as it has been observed on three specimens of the skull of *P. expansa*.

"In *P. expansa* there are three ridges; the two front ones are nearly parallel, and they diverge from the centre towards the hinder end of the maxillary edge, so that they are at an angle both with the maxillary edge and with the edge of the internal nostrils; of these two ridges, the front is only half the length of the hinder one. The third ridge is scarcely raised, broad, rugose on the edge of the concave cavity for the internal nostril.

"In *P. Dumeriliana* there are only two ridges, both of which are parallel to the edge of the jaw and the edge of the palatine cavity, which are nearly parallel to each other. The front of the two ridges is much the strongest and largest; the hinder one is shorter, narrower, but well developed and very near the edge of the palate-opening, as is well represented in Cuvier's figure of the skull of *Emys expansa* (Oss. Foss. t. 11. f. 9–12).

"In the skull of the older *P. expansa* the two front ridges become higher, more tubercular, and do not increase in length with the size of the skull; so they appear shorter in proportion; and the tubercular ridge on the margin of the opening to the internal nostril is less distinct. The skull of a very young specimen of this species is figured by Wagler in his Atlas to his N. Syst. Amph. (t. 4. f. 5–9) as *Podocnemis expansa*, and the skull of a full-grown but not

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adult specimen in plate 27. f. 1, in my 'Catalogue of Shield Reptiles in the British Museum;' but, unfortunately, in the latter figure the artist, in the otherwise very accurate figure, has scarcely made the two front ridges at a sufficient angle with the edge of the jaws and the opening of the internal nostrils.

"In the 'Archives du Muséum' (vol. vi. p. 242), M. Auguste Duméril describes a third species of *Podocnemis*, under the name of *P. Lewyana*, which was received from Bogotá and Venezuela, which appears by the figure (that is to say, if it is correct) to have an oblong, broad, transverse instead of a long frontal plate; but, unfortunately, there are no details of the skull given."—*P. Z. S.* 1864, pp. 134, 135.

The thorax is oval, very depressed, with a sunken vertebral bone and an entire edge.

3. PELTOCEPHALUS.

Head high, subcompressed. Nose produced, on a level with the forehead, rounded above, without any groove; nostril apical. Temporal muscles entirely covered with bone. The costal shields with a subposterior superior fold.

Peltocephalus, *Gray, Cat. Sh. Rept.* 61; *P. Z. S.* 1864, p. 135.

1. Peltocephalus tracaxa. B.M.

Peltocephalus tracaxa, *Gray, Cat. Shield Rept.* 61; *P. Z. S.* 1864, p. 135.
Spix, Test. Bras. t. 4, 5.

Hab. Tropical America.

The skull of this genus bears some resemblance to that of the *Cheloniadæ*, in having a vaulted bony arch covering the temporal depressions which is entirely formed of the parietal bones. It differs from the skull of the Marine Turtle in the vomer not being ossified; and hence the internal nostrils are not divided by a septum (see Owen, Cat. Osteol. p. 203).

Suborder IV. Trionychoidea, or Soft Turtles.

Toes developed, spreading, webbed; claws 3.3, acute. Pelvis attached to the vertebræ only. Thorax and sternum covered with a soft skin having an expanded and reflexible margin. Beak covered by fleshy lips.

Amyda, *Schweigger, MS.* (see *Prod. Mon. Chelon.* 13).
Trionychidæ, *Gray, Cat. S. R.* 62; *P. Z. S.* 1855, p. 201, 1864, and 1869, p. 109.
Agassiz, Contrib. 394.
Chilote, *Wiegmann in Ruthe's Handbuch*, 167.

The Soft Turtles are peculiar for having the head covered with a soft fleshy skin; the skin of the face very thick and covering the horny beak from view, and generally the upper lip is produced into a rounded lobe dependent over the opening of the mouth.

Several of the Emydidæ have the outer surface of the beak more or less soft and ornamented with colours, like the skin of the neck.

In some respects the head of *Batagur* is allied to that of the *Trionyches*; the soft skin of the crown and temple of that genus is divided into tesseræ or small shields by grooves; and the sides of the lower jaw are covered with peculiar shields or plates, never found in other genera of Terrapins.

"*Trionyx*: flesh good. *Tetraonyx* used to make turtle-soup in Calcutta."—*Theobold, Journ. Linn. Soc.* x. 1868, p. 9.

In Hardwicke's collection of drawings of Indian animals, which contains some made by himself and some that were drawn by Chinese artists for Mr. Reeves, from living Chinese animals, are figures of *Emyda punctata*, *Trionyx subplanus*, *T. hurum*, and *T. javanicus*. They are all represented as having the iris circular, without any spots on the sides.

In my 'Illustrations of Indian Zoology' are some plates, copied from Dr. Hamilton's drawings, containing figures of *T. hurum*, *T. subplanus*, and *T. javanicus*, which are also represented as without the spots.

In Hardwicke's collection *Chitra indica* is represented as having a spot on each side of the pupil, but is very narrow.

The two North-American species of *Trionyx* figured by Holbrooke have each a spot on the iris on each side of the pupil, forming a narrow horizontal band across the pupil.

In the quarto 'Catalogue of Shield Reptiles in the British Museum' the species of this family were carefully revised, and the skulls of the genera as far as they were then contained in the Museum Collection were figured. Since that period several other Asiatic and African species have been described in the 'Proceedings of the Zoological Society.'

Very shortly after the appearance of the 'Catalogue of Shield Reptiles,' Professor Agassiz, in the 'Contributions to the Natural History of the United States' (2 vols. 4to, 1857), published his observations on this group. He remarks that "a critical revision of the genera of *Trionychidæ*

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appears a great desideratum in herpetology,"—and goes on to say, "I have already satisfied myself that the number of species is much greater than is generally supposed;" and further, "in this connexion I would remark that it is hardly possible to distinguish the *Trionychidæ* by their external characters, and that nothing short of a careful examination of their jaws, and especially of the skull, will reveal their generic characters."—*Contrib.* 396.

These observations are fully justified by the study of the Asiatic and African species contained in the Museum collection.

I have therefore reexamined the materials at my command, referring to the 'Catalogue of Shield Reptiles' and my previous papers in the 'Proceedings' of the Zoological Society for the descriptions and the figures of the species before described.

As the American museums appear to have a very small collection of specimens of these animals from Africa and Asia, so the British-Museum collection has scarcely any specimens from North America, and unfortunately I have no means of comparing the skulls of any of the American species with those from the Old World.

Professor Agassiz, in the 'Contributions,' shows that they belong to three genera, which he calls *Amyda*, *Platypeltis*, and *Aspidonectes*, containing six species; and I must refer naturalists to his work for the particulars, regretting that he has not given us figures of the skulls of these and other genera of Tortoises mentioned in his work for comparison.

Referring to the American species, Professor Agassiz justly and philosophically observes, "The external resemblance between *Platypeltis ferox*, *Aspidonectes spinifer*, and *A. asper* is so great that I am not surprised that they have been confounded or even deliberately considered identical. We have, in fact, a case here, of which a few other examples only are thus far known, in which, under the most surprising similarity of external appearance, marked structural peculiarities amounting to generic differences are hidden. I have already pointed out such cases in the genera *Phoxinus* and *Chrosomus*, and in the genera *Carpioides*, *Bubalichthys*, and *Ichthyobus* among Cyprinoids."—*Amer. Journ. of Science*, 2nd ser. xix. 71. "Many similar examples might be quoted among the Rodentia."—*Contrib.* 410, note. Such cases are much more common than has hitherto been suspected; and it is on such superficial resemblances that Mr. Bates's observations and theories respecting the Brazilian Butterflies are founded—notions which will vanish into the air when the insects are more carefully examined by a systematic entomologist.

Dr. Holbrook and, after him, Professor Agassiz pointed out a difference in the form and structure of the nostrils in the American species.

Thus in *Amyda mutica* the nostrils are small, simple, circular, and far apart, rather on the underside of the snout.

In *Platypeltis ferox* and *Aspidonectes spinifer* these are larger, close together, and with a process on the middle of the inner side of each.

Unfortunately it is not possible to make similar observations on the African or Asiatic species, as one has not the power of observing them alive. Indeed they rarely arrive in a sufficiently good state to make the comparison with certainty in the specimens preserved in spirits. All the African and Asiatic species that I have been able to examine seem to have nostrils as in *Platypeltis* and *Aspidonectes* of Agassiz.

The British Museum contains only two adult stuffed and four or five young specimens, and no osteological preparations of the American species; I shall not attempt to make any observations of them, but refer the reader to the work of Professor Agassiz, and proceed to examine with care the specimens of the Asiatic and African species in the Museum collection.

In the Museum Catalogue I showed that the coloration of the young specimens, especially the disposition of the colour on the head, afforded very good specific characters for a certain number of Asiatic and African species. But Professor Agassiz, in his account of the North-American species, shows most distinctly that, though all the species of *Trionyches*, or Mud-Tortoises, found in that country have a very similar distribution of colour on the head and shields, yet, when the skulls of these animals from different localities are examined, they prove to be very distinct—so distinct that he divides them into three genera.

These observations will furnish an example showing how every zoologist must be hampered at every step in his progress by the limited quantity of the materials at his disposal. I have now, and had when I printed my 'Catalogue of Shield Reptiles,' every wish to examine and arrange the species of this family according to their organization, both external and internal; but when I printed the former catalogue I had only the skulls of three species. I have been able to add considerably to the collection of skulls; but the number of known species has also extended, and now the skulls of only about half of the species determined on their external form and coloration are known, so that I am not able to make the rigorous examination and comparison between the skulls that I could wish; and I am by no means sure, after what I have seen, and especially after

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the facts stated by Professor Agassiz, that more than one species may not be confounded under one name, from the species having been simply determined by their external form and coloration.

Wagler, in his 'System,' separated the species that had their hind legs covered with moveable valves and the margin of the shield bony, from those which have the hind legs free and the margin of the disk flexible, calling the former *Trionyx*, and the latter *Aspidonectes*. In my Synopsis of Reptiles in the translation of Cuvier's 'Animal Kingdom,' I retained the name of *Trionyx* for the latter group (as it contained the typical species of the genus), and called the former one *Emyda*. Duméril and Bibron, with the usual habit of the French naturalists, gave new names to all the groups, calling the first group *Cryptopus*, and the latter *Gymnopus*.

Dr. Peters, when in Mozambique, discovered a Tortoise (which he at first called *Cyclanosteus*, but afterwards *Cyclo-derma*) intermediate between these two groups, having the hind leg covered with sternal valves, and the margins of the shields boneless and flexible.

I may here observe that I cannot agree to the changes in the nomenclature proposed by Professor Agassiz in the 'Contributions,' at pp. 396 and 397; indeed I am convinced that, if he had studied the Indian and Asiatic species as he has the American, he would modify his suggestions.

Fitzinger, in his "Systematic Catalogue of Tortoises" in the 'Annals of the Vienna Museum,' published in 1836, divided the *Trionyches* with free feet and a flexible margin into four genera, containing most incongruous species associated together (for example, *Trionyx javanicus* and *T. ægyptiacus* of Geoffroy and *T. indicus* of Gray, *Trionyx muticus*, Lesueur, and *T. subplanus*, Geoffroy) in the same genus. Sometimes he refers the same species (as, for example, *T. ægyptiacus*, Geoffroy, and *T. labiatus* of Bell, which are only states of the same species) to two genera, as the first to *Aspidonectes*, and the latter to *Pelodiscus*.

Professor Agassiz truly remarks, "All these new genera are founded upon delusive characters, as Gray has already stated, which depend only upon the progress of the ossification of the shield, and may be observed in specimens of different ages of one and the same species, as my numerous skeletons of these Turtles clearly show; moreover the difference in the length of the tail is only sexual, the tail being very short in the female, and extending beyond the rim of the shield in the males of all the species that I know."—*Contrib.* 395, 396.

If the generic names which Fitzinger has given are used, it must be with quite a different significance than that attributed to them by him. They may be retained for some of the species which he referred to his badly characterized groups.

Professor Agassiz, in describing the genera of the North-American Terrapins, places great confidence in the form of the alveolar surface of the jaws, and probably correctly, as he seems to have studied this part in a series of specimens of different ages. My observations would lead me to believe that it is of considerable importance in the distinction of the *Trionychidæ*; but there are two specimens which I have received from the same locality (which are in other respects so much alike that I am inclined to believe that they are skulls of the half-grown and adult animals of the same species) that are so different in the form of the alveolar surface as to induce me to believe that this part alters considerably during the growth of the animal, at least in some species of the family; nevertheless additional specimens may show that what I have taken for alterations in growth are, in fact, specific distinctions. The examination of the skulls of the half-grown and the adult *Tyrse nilotica* and *Trionyx gangeticus*, the only species that I have at present the power of examining in more than one state of growth, does not reveal any great change in the form of the alveolar surface as the animal increases in age. But there is no reason why a change of this kind may not take place in one species or genus, and not occur in others or in the generality of the species. I have therefore for the present adopted Professor Agassiz's views.

He uses the form of the alveolar edge as of generic importance, and this when he says he has a series of skeletons from animals of different ages. He describes as follows:—

"Thus the alveolar edges of the lower jaw of *Amyda* and *Aspidonectes* are sharp all round."—*Contrib.* 398 & 403.

In *Platypeltis* "the lower jaw, like the upper, has a very broad alveolar surface; this surface is nearly flat at the symphysis, but has a deep depression near the hinder end."—*Contrib.* 400.

My researches have shown that the form of this part is permanent in all ages in the Asiatic and African species.

The examination of the series of specimens at my command induces me to place considerable confidence in the characters furnished by the general form of the skull—in the position of the internal nostrils, whether they are placed in a deep or a shallow groove in the palate, and if that groove is situated only behind the internal nostrils, or is continued in front to the edge of the jaws, and, if so continued, whether it is nearly of the same width throughout its length, or more or less contracted in front of the

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interior nostrils—and also in regard to the position of the internal nostrils themselves, whether they are in the front of the palate or some distance from the front edge, so as to be nearly on a level with the front edge of the zygomatic arches.

The genera, for example, may be divided into two groups by the forms of the skulls, which probably indicate some peculiarity in their habits, quite as important as the form of the sternum and the flexibility or inflexibility of the edge of the dorsal disks; but so little is known of the habits and manners of these animals, that we have no materials to work from.

A. The skull solid, convex, subtrigonal; nose moderate; eyes lateral; the palate concave, with raised alveolar edges, and a deep oblong concavity enclosing and extending behind the internal nostrils.

Emyda. Cyclanosteus. Trionyx. Tyrse. Dogania. Rafetus.

B. Skull oblong, thin, and light; nose very short; eyes anterior; forehead flat, often elongate; palate flat, with scarcely raised alveolar edges, and only a very slight depression before and behind the internal nostrils.

Chitra. Heptathyra. Pelochelys.

There is a very considerable difference in the form of the grooves in the palate, and in the position of the internal nostrils.

In *Trionyx gangeticus* the groove is very broad, equally open and of an equal width, with the circular internal nostrils behind, on a level with the front of the zygomatic arches.

In *Potamochelys stellatus* the groove is very narrow in front, partly arched over on the sides by the inner edge of the large alveolar margin, with the oblong internal nostrils very close together, in a line with the middle of the upper lip.

In *Rafetus euphraticus* the palate-groove is intermediate in form between that of *Trionyx* and *Potamochelys*, being broad, deep, entirely open, but rather narrower in front, with the large circular internal nostrils rather in front of the zygomatic arches.

In *Cyclanosteus senegalensis* the palate is somewhat like that of *Potamochelys*; but it is not so much contracted in front, and the oblong internal nostrils are larger, broader, and nearly in the same situation.

In *Tyrse nilotica* the palate is regularly concave in front of the internal nostrils, which are in a deep pit, just before the front of the zygomatic arches, and this concavity is divided by a longitudinal ridge between the nostrils.

There is an apparent anomaly in the development of the sternal callosities, which can only be solved by the conjecture that (as Professor Agassiz declares to be the case) there are several species which have very much the same external appearance. In more than one of the species under examination, the sternal callosities are well developed in some specimens, and scarcely visible in others of the same species and, sometimes, even of a larger size. (Gray, P. Z. S. 1864.)

When my "Revision of the Species of *Trionychidæ*" was read, on the 23rd February 1864 (see P. Z. S. 1864, p. 76), I was in doubt whether the alveolar surface of the jaws of these animals did not change in form as the animal increased in age, this doubt being caused by receiving from West Africa skulls from the same locality which chiefly differed in size and in the form of the alveolar surface. The British Museum has since received other specimens from West Africa; and, after examining them, I am satisfied that the skulls referred to belonged to two species, and that the difference of form and structure above mentioned is permanent and found in young specimens as well as old of the two species; and the examination of the jaws of the young specimens of other species in the Museum collection has convinced me that very little, if any, change of form occurs in the alveolar surface of the soft Mud-Turtles of the same species from youth to old age, and that the various forms of the alveolar surface afford excellent characters for the distinction of the species and genera of the group, and are also in conformity with their habits and food. Extending the examination of the mouth to old and young specimens of Tortoises of other families, I find that these characters are equally permanent in them.

When the above-mentioned essay was prepared, as we had only a limited number of skeletons, I was obliged to leave in it a number of species doubtful as to the genera to which they ought to be referred. Having discovered that the characters afforded by the alveolar process were the same in the young specimens as in the older ones, I was induced to examine the mouths of all the young specimens which we had in spirit in the British Museum; and finding that, by very careful preparation and manipulation, I could open the mouths of the stuffed specimens in the same collection without in the least degree injuring them, I have examined the mouth and alveolar surfaces in all of them, and thus satisfied myself of the permanence of the characters that these afford, and have been able to determine with certainty the systematic position of some species, which was before doubtful.

This reexamination has also shown me the permanence

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and the importance, as a specific character, of the manner in which the odd bone in front of the bony dorsal disk is developed, and whether it is in an early or late stage of its development that it becomes pitted like the rest of the bones of the disk, and when it becomes united to the front bone of the disk.

These additions to my knowledge of the structure and development of the animals induce me to propose the following amended arrangement of them. A natural arrangement of the genera can only be prepared by taking account of all the changes of the animal during growth, and deriving the characters from it in its perfect state. The young specimens are required in order to know the coloration of the species, the adult to know the perfect development of the sternal callosities, and those of intermediate ages to give the manner the odd bone in front of the dorsal disk is developed, and when and how it becomes pitted like the other bones of the back-shield; but this has rendered it impossible to interpolate in their proper place in the system those specimens in the Museum which are only in a young or imperfect state of development, not showing the sternal callosities or the true form of the dorsal disk.

The Mud-Turtles with depressed head and thin depressed skull have a very short face, and the eyes only a very short distance from the end of the nose; all the genera which have a higher, strong, hard skull have a short face and a convex rounded forehead, except *Tyrse*, which has an elongate conical face, and the eyes considerably further back.

The genera of the latter group may be arranged according to the number of the sternal callosities, thus:—

I. Sternal callosities two, lateral: *Aspilus*, *Rafetus*, *Dogania*.

II. Sternal callosities four, lateral and anal: *Trionyx*, *Potamochelys*, *Pelochelys*, *Chitra*, *Tetrathyra*, *Platypeltis*.

III. Sternal callosities six, lateral, anal, and pectoral; the latter transverse and developed late: *Landemania*.

IV. Sternal callosities seven: *Heptathyra*.

V. Sternal callosities nine (or ten): *Emyda*.

VI. Sternal callosities fifteen, and often subsidiary ones: *Cyclanosteus* and *Baikiea*.

The development of the pittings on the surface of the odd bone in front of the bony dorsal disk affords good generic characters.

1. It is smooth to a comparatively later period, even after the sternal callosities are developed, in *Aspilus*.

2. It is pitted in the centre in very young, and gradually becomes more covered with pits in more adult specimens in *Trionyx*, *Potamochelys*, and *Tyrse*.

The Mud-Turtles with a depressed thin skull and very short face have a broad flat palate and scarcely any indication of a central groove in front of the internal nostrils, and only a slight depression, if any, behind them; whereas in the more or less oblong, thick, solid skulls the palate is more or less concave, and almost always has a central groove in front and two more or less deep concavities behind the internal nostrils. The extent and form of the depressions afford very good generic characters.

The skulls of the *Trionychidæ* may be arranged in sections thus:—

1. The central groove in front of the internal nostrils narrow and—
   a. Deep: *Landemania*, *Sarbieria*, *Potamochelys*, ? *Platypeltis*, *Callinia*, ? *Emyda*.
   b. Very shallow: *Aspilus*.
2. Central groove in front of the internal nostrils short, triangular, narrow in front: *Cyclanosteus*, *Baikiea*, *Tetrathyra*.
3. Central groove in front of the internal nostrils wide and shallow, but well marked: *Trionyx*, *Rafetus*, *Dogania*, *Tyrse*.

The form of the edge of the jaws, and the extent of its development, afford excellent characters, and show the differences in the habits of these animals. In the Mud-Turtles with depressed, thin, light skull, and short face, the alveolar edges of the jaws are thin and linear. In those which have a more or less high, solid, strong skull, the edge of the lower jaw and the surface of the upper one that meets it offer several variations. The genera may be arranged by the different forms of the alveolar surfaces, thus:—

1. The edge of the lower jaw flattened and broad in front and on the sides: *Trionyx*, *Aspilus*, *Rafetus*, *Baikiea*.
2. The front edge of the lower jaw narrow; the inner surface of the front part of the jaw shelving inwards.
   a. In some of these the hinder part of the sides of the edge is more or less expanded and flattened out into an alveolar disk: *Dogania*, *Potamochelys* *Cyclanosteus*.
   b. In others the sides of the edge are as narrow as the front part: *Tyrse*, *Platypeltis*, *Callinia*.

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SYNOPSIS OF THE FAMILIES.

1. **CHITRADÆ.** Margin of the disk expanded, flexible, without any internal bones. Head depressed; eyes near the end of the nose, superior. The skull oblong, thin; forehead longer than the nose; palate flat.

2. **TRIONYCHIDÆ.** Margin of the disk expanded, flexible, without any internal bones. The skull solid, oblong, swollen, concave above; palate concave, with a pit behind each internal nostril.

3. **EMYDINADÆ.** The margin of the disk strengthened with a series of internal bones. Skull oblong, swollen, convex; the palate with a central groove.

Fam. I. CHITRADÆ.

The margin of the disk expanded, flexible, without any internal bones. The head depressed; face very short; eyes anterior, superior. Skull oblong, thin; nose very short; orbits anterior; forehead elongate, longer than the face; palate flat, with a scarcely raised alveolar edge, and only a very slight depression before and behind the internal nostrils.

Trionychidæ, Section II., *Gray, P. Z. S.* 1869, p. 215.
Trionychidæ, § B, *Gray, P. Z. S.* 1864, p. 89.

SYNOPSIS OF THE GENERA.

1. *Sternum contracted behind, without any flaps over the hind legs. Sternal callosities in pairs.*

1. **Chitra.** Skull elongate; forehead shelving, much produced behind; nose very short, convex; alveolar edge of each jaw with a deep groove.

2. **Pelochelys.** Skull short and broad, much depressed; alveolar edge of both jaws flat, simple.

2. *Sternum dilated behind into flaps on each side covering the hind legs. Sternal callosities odd and in pairs.*

3. **Heptathyra.** Sternal callosities 7.

1. *Sternum contracted on the sides behind, without any flaps over the hind legs. Sternal callosities in pairs.*

a. *Skull elongate; forehead shelving, much produced behind; nose very short, convex; alveolar edge of each jaw with a deep groove.*

1. CHITRA.

The head elongate, depressed; nose very short; eyes near the front margin; forehead elongate, slightly convex, shelving. Skull elongate, ventricose, thin, light; the nose very short, convex; orbits very large, near the front margin; the forehead very much elongated, several times as long as the face, shelving, slightly convex (see 'Cat. Shield Reptiles,' t. 41). Palate flat, concave in the centre; internal nostrils anterior, with only a very slight, very broad depression behind each of them; alveolar edge with a deep angular groove, concentric, with sharp outer edges. Lower jaw strong, with a deep angular alveolar groove, concentric with the sharp outer edges (see Cat. Shield Rept. B. M. t. 41). The first vertebral plate of the dorsal disk is rather broad and transverse, arched in front; but (in the younger specimen at least) it is not so broad as the front edge of the second vertebral plate of the disk.

Chitra, *Gray, Cat. Tort. B. M.* 49; *Cat. Sh. Rept.* 70; *P. Z. S.* 1864, p. 91; 1869, p. 215.

This genus and *Pelochelys* are so similar externally, especially in the dried or stuffed specimens, that the specimens were named alike in the British Museum, and so remained for years, though in the meantime they had been examined by several herpetologists, both English and foreign. It is only by a slight difference in the length of the head, compared with the width and the flatness and slight convexity of the forehead, that they can be distinguished, different as the forms of the skulls are.

1. Chitra indica. (Skull, fig. 28.) B.M.

Testudo chitra, *B. Hamilton, Icon. ined.*
Trionyx ægyptiacus, *var.* indicus, *Gray, Illust. Ind. Zool.* i. t. 80.
T. indicus, *Gray, Syn. Rept.* 47.
Chitra indica, *Gray, Cat. Tort. B. M.* 49; *Cat. Sh. Rept. B. M.* 70 (part), t. 41 (skull); *P. Z. S.* 1864, f. 11, 12 (skull), 1869, p. 215.
Gymnopus lineatus, *Dum. et Bib. Erp. Gén.* ii. 491.

Face of skull very short, flat above; forehead flat, rather concave, slightly swollen between the hinder parts of the eyes. The palate flat, slightly concave in the middle behind the posterior nostrils. The alveolar surface of the maxilla nearly flat, with a narrow slightly raised edge.

Pupil very small, circular, with a very narrow dark line on each side of it.

Hab. India: Ganges; Futteghur (*Hardwicke*); Nepal (*Falconer, Boys*).

The young specimens are olive, with short black lines on the head, and dorsal disk marbled with darker bands and streaks.

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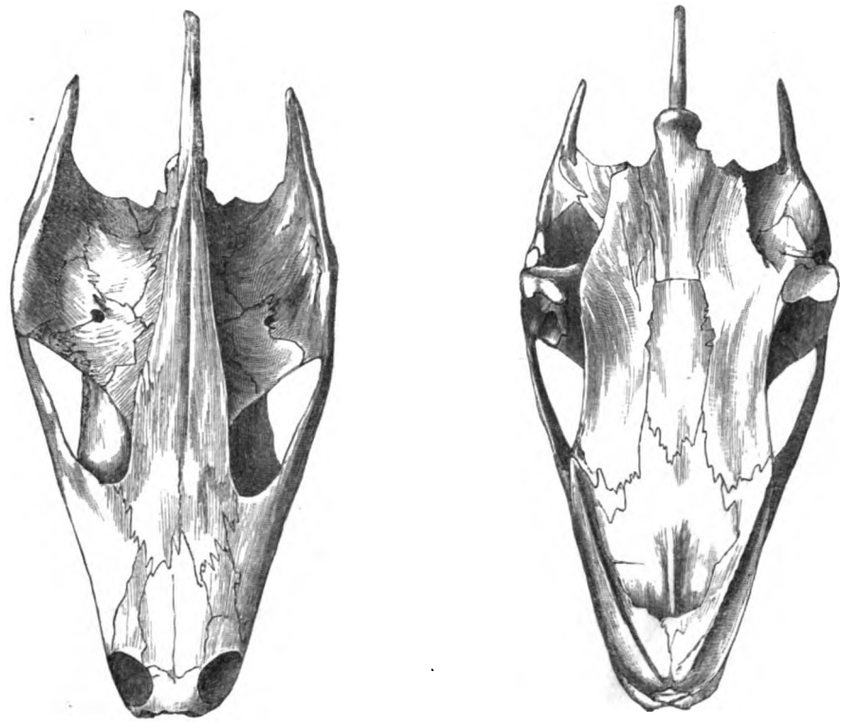
Fig. 28.



Chitra indica.

b. *Skull short and broad, much depressed; alveolar edge of each jaw flat, simple.*

2. PELOCHELYS.

Head depressed, moderate-sized; the face very short, shelving; eyes rather close together, superior; the forehead flat, rather concave; skull much depressed, broad; nose very short, shelving; orbits very large, subanterior; forehead depressed, rather concave; præfrontal bones large; præmaxillary bones none; the maxillar bone circumscribing the lower edge of the exterior nostrils. Palate nearly flat, very broad, rather convex in the centre behind, slightly concave (but without any central groove) in front of the internal nostrils. Internal nostrils oblique, oblong, with a rather wide, deep, short groove behind each of them. The alveolar edge flat, simple, with an acute scarcely raised edge. Lower jaw very slender, weak, with a simple sharp edge, with a slightly thickened internal rib. The first vertebral plate of the shield as broad as the front edge of the second one.

Pelochelys, *Gray, P. Z. S.* 1864, p. 89; 1869, p. 215.

Professor Owen, in the account of the skull of genus which is in the College of Surgeons, named *Trionyx Bibroni*, no. 954, describes the difference between it and the skull of *Trionyx gangeticus*, and a *Tyrse* allied to *T. nilotica*, and he also describes some peculiarities in the formation of the dorsal disk (see Cat. Osteol. Spec. Mus. Coll. Surg. p. 185, nos. 954–959).

1. Pelochelys Cantorii. (Skull, fig. 29.) B.M.

Chitra indica, *Blyth, J. A. S.* 1863, xl. 77.
Günther, Indian Rept. t. (not *Gray*).
Gymnopus indicus, *Cantor, Rept. Malacca*, 10.
Pelochelys Cantorii, *Gray, P. Z. S.* 1864, f. 9, 10 (skull); 1869, p. 215.
Theobald, Journ. Linn. Soc. x. 1868, p. 10.

Hab. Aracan (*Dickel, B. M.*); Malacca, marine (*Cantor; Blyth*).

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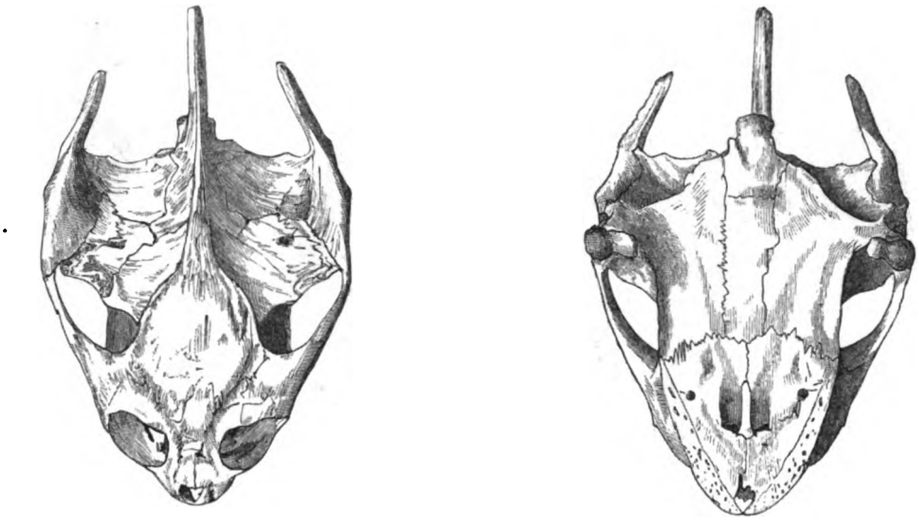
Dr. Günther, who soaked Dr. Cantor's specimen, says he observed some black lines on the head and throat, and some dark marbling on the edge of the dorsal disk, as in *Chitra indica*.

The form of the animal figured in 'Indian Reptiles' is from the Museum specimen of this species, with the markings and colour added from General Hardwicke's figure of the living *Chitra indica*. Dr. Günther believed they represented the same animal.

An adult stuffed specimen from Aracan, in the British Museum, purchased of Mr. Theobald:—The odd anterior bone pitted and united to the front rib by a straight suture. Sternal callosities 4, the lateral with a broader inner edge; anal callosities oval, triangular, rather larger than broad.

Fig. 29.



Pelochelys Cantorii.

2. Pelochelys Cumingii. B.M.

Chitra indica (part.), *Gray, Cat. Sh. Rept. B. M.* 70.
Pelochelys Cumingii, *Gray, P. Z. S.* 1864, p. 90.

Hab. Philippines (*Cuming*).

Much larger than the preceding, which has the sternal callosities fully developed.

The young specimens that Mr. Cuming brought home, apparently belonging to the same species, have the head olive, minutely black-dotted; the throat olive, minutely white-speckled.

Dorsal disk broad, convex, rounded in front, and truncated with a concave margin behind. The odd anterior bone broad, united by a straight suture to the rest of the bones, tubercular, like the others. Vertebral plates narrow, front one twice as long, becoming gradually shorter and smaller, more hexangular; the costal callosities rather dilated at the outer ends. The lateral sternal callosity broad, about as long at the inner as at the outer end; the anal callosities triangular, with a straight internal edge.

3. Pelochelys Bibronii?

Pelochelys Bibronii, *Gray, P. Z. S.* 1864, p. 90.
Trionyx (Gymnopus) Bibroni, *Owen, Cat. Osteol. Spec. Mus. Coll. Surg.* 185, nos. 951–959.

Hab. ?Australia (*Capt. Sir E. Home, F.R.S., fide Owen*).

This is only known from a skull, a dorsal disk, and some other bones in the Museum of the College of Surgeons.

Prof. Owen, in the 'Catalogue of the Osteological Specimens in the Museum of the College of Surgeons,' describes the skull on which this species is founded. It differs from the skull of the young specimens of *P. Cantorii* in the Museum collection from Malacca in being rather longer compared with its width; but then that may depend on the age of the specimen, for its size and the bones of the dorsal

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disk show that it belongs to a more adult specimen than the young one with which I was able to compare it.

There is some doubt as to the skull in the College of Surgeons having been obtained from Australia, as I have never heard of any Mud-Tortoises being found in that country; and it is not unlikely that the specimen was obtained from Singapore, or, if obtained from Australia, may have been carried there.

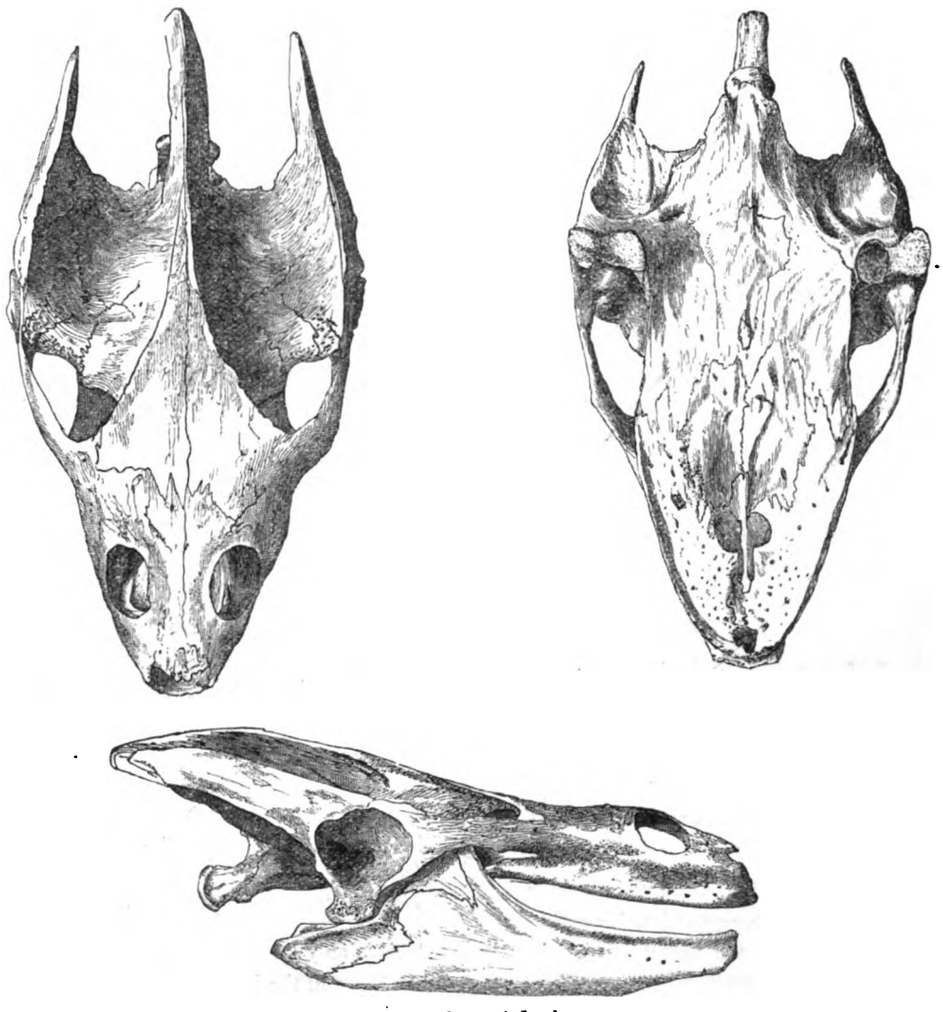
2. *Sternum dilated behind into flaps on each side covering the hind legs. Sternal callosities odd and in pairs.*

Trionychidæ, Section II. *a*, *Gray*, *P. Z. S.* 1864, p. 92.

3. HEPTATHYRA.

Heptathyra, *Cope*, *Proc. Acad. N. S. Philad.* 1859, p. 295. *Gray*, *P. Z. S.* 1860, p. 315; 1864, p. 92; *Ann. & Mag. N. H.* 1860, vi. 441.

Fig. 30.



Heptathyra Aubryi.

Cycloderma, sp., *Peters*, *Berl. Monatsb.* 1854.
Cyclanosteus, *Peters*, *MS.* 1850.
Gray, *Cat. Shield Rept.* 1855.
Aspidochelys, *Gray*, *P. Z. S.* 1860.

The skull of this genus is analogous to the skull of the genus *Pelochelys* among the naked-footed *Trionychidæ*, as the skull of *Cyclanosteus* resembles that of the more typical *Trionychidæ*.

The genus *Cycloderma* of Peters was instituted to contain all the *Cryptopi* of Duméril which had a boneless,

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flexible margin to the shield, without paying any attention to the number of the callosities, which are also coexistent with a very differently shaped skull and, doubtless, different habits in the animal.

1. Heptathyra Aubryi. (Fig. 30.) B.M.

Cryptopus Aubryi, *A. Dum. Rev. Zool.* 1856, pp. 37, 364, t. 20.
Heptathyra Aubryi, *Cope, Proc. Acad. N. S. Phil.* 1859, p. 296.
Gray, P. Z. S. 1860, p. 315; 1865, p. 427.
Heptathyra frenata, *Gray, P. Z. S.* 1864, p. 93. f. 13–15 (skull).

Hab. Africa: Gaboon (*Duméril*).

2. Heptathyra frenata. B.M.

Cyclanorbis frenata, *Peters, MS.* 1848.
Cyclanosteus frenatus, *Peters, MS.* 1850.
Gray, Cat. Shield Rept. B. M. 64, 1855.
Cycloderma frenatum, *Peters, Monatsbericht*, 1854, p. 216.
Aspidochelys Livingstonii, *Gray, P. Z. S.* 1860, p. 6, pl. xxii.; ibid. 315.
Heptathyra Livingstonii, *Gray, P. Z. S.* 1864, p. 94.
H. frenata (partly), *Gray, P. Z. S.* 1864, p. 94; 1865, p. 428.

Hab. Central Africa: River Zambesi (*Peters*, Mus. Berlin; *Livingstone*, Mus. Brit.).

These two species may be the same; they both have black marks on the head; but I have not been able to compare them.

The difference in the form of the callosities may depend on the age or the individual peculiarities of the two specimens figured.

Dr. Sclater informs me that, judging from a cursory examination, the specimen in the Berlin Museum seemed exactly like that figured in the 'Proceedings.'

"The British Museum has lately received from Dr. Livingstone the dorsal and sternal shields of a large fluviatile Soft Tortoise from the country near the Zambesi. The dorsal disk is 22 inches long, and 17 inches wide over the convexity of the back. It was accompanied by the skull of a fœtal African Elephant, and some other bones of that animal.

"Some years ago I received through the Earl of Derby a Soft Tortoise from the River Gambia, which differed from the genus *Emyda*, to which it was allied, in having no bones on the hinder part of the margin of the dorsal shield. I therefore proposed to establish for it a new genus.

"When I described this genus I called it *Cyclanorbis*, but received a note from Dr. Peters, before the account of this genus was printed, in which he informed me that he had found near Mozambique, on the River Zambesi, a Tortoise which was called *Casi*, which wanted these bones on the hinder part of the margin of the dorsal shield, and which he had proposed to call *Cyclanosteus frenatus*, on account of certain black streaks on the head. I obliterated my name, and adopted that which my friend Dr. Peters had suggested, and described the one I had received from the Gambia under the name of *Cyclanosteus Petersii* (Proc. Zool. Soc. 1853; Ann. & Mag. N. H. 1855, xv. 69; Catalogue of Shield Reptiles in the British Museum, 64, t. 29).

"The animal from the Zambesi which we have received from Dr. Livingstone agrees with the animal from the Gambia in wanting the bones in the hinder part of the margin of the dorsal shield; but it differs so essentially in the structure of the sternum that it is necessary that another genus should be established for its reception. Now it may be the *Casi* of the natives; but unfortunately Dr. Livingstone has not sent its native name: and it may be the *Cyclanosteus frenatus* of Dr. Peters; but I cannot find any description of that animal. It is not noticed, nor any other Tortoise, in the review of the Amphibia collected during his Travels, which Dr. Peters published in the 'Monatsberichte der Berliner Academie,' 1854, p. 614, and which is reprinted in Wiegmann's Arch. 1855, p. 43. Under these circumstances, as I applied Dr. Peters's name *Cyclanosteus* to the animal from the Gambia, and first gave the character to that genus derived from that species, and as my description of that genus appears to be the only one that has been published, I think that the name *Cyclanosteus* must be retained for the Gambian Tortoise, although probably Dr. Peters in his note intended it to refer to the Mozambique form. If I do so, the reference to Dr. Peters MS. must be erased from my account of the animal in the papers above referred to, and I must give a new name to the genus to be established on the Tortoise from the Zambesi.

"This genus may be considered in some respects intermediate between *Cyclanosteus* and *Emyda*; for, though it has the simple flexible boneless hinder margin of the dorsal shield of the former genus, it has the seven sternal callosities of the latter; but these callosities, though they agree in number, are of a much smaller size compared with the size of the animal than those of the genus *Emyda*.

"It is the giant of the group, agreeing in size and development with the genera of this family which have the legs exposed, and especially with the genera *Trionyx* and *Chitra*."—*Ann. & Mag. Nat. Hist.* 3rd ser. vol. vi. 68.

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"In the 'Proceedings' for 1860, p. 5, I described and figured a Soft Freshwater Turtle from the Zambesi under the name of *Aspidochelys Livingstonii*; at p. 314 are printed some further observations on the African *Trionyches* with hidden feet (*Emyda*); and in both these papers I state that I had not been able to find any published description of a Tortoise from Zanzibar that Dr. Peters had indicated to me in a letter to myself in 1848 under the name of *Cyclanosteus frenatus*.

"Dr. Peters, through Mr. Sclater, has kindly referred me to a paper by him on the Tortoises found during his travels, in the Berichte der Königl. Akad. zu Berlin for 1854, p. 276, where the Tortoise from Zanzibar is very briefly described, but under the name of *Cycloderma frenatum*; and has stated that he believes it is the same as the one I described from the Zambesi. Mr. Sclater says that he has seen two or three fine perfect specimens of this Tortoise in the Berlin Museum. Under these circumstances, there can be no doubt that my name must give way to that used by my friend Dr. Peters.

"I may at the same time observe that the genus *Cycloderma* is so characterized by Dr. Peters that it will include all the African *Emydæ*, all of which have the dorsal disk flexible on the margin and without any marginal bones. On the contrary, my genus *Cyclanosteus*, to which I had provisionally referred Dr. Peters's species, is by its character confined to those species of the African *Emydæ* which have nine sternal callosities.

"As Dr. Peters, before he published the characters of the genus, considered it desirable to change the name of the genus which I had adopted from his MS. communication, and founded his genus *Cycloderma* on a species that has only seven sternal callosities (though he only mentions the number of the callosities in the specific character, and probably would have considered my animal with nine callosities as the second species of his genus), I think, if the two animals are to be kept in different genera, as I am of opinion they ought to be, we ought in justice to retain his name for the restricted genus, in preference to my name of *Aspidochelys*, or Mr. Cope's genus *Heptathyra*, which are founded on this peculiarity.

"The synonyma of the Zambesi and Zanzibar Tortoise will then stand thus:—

Cycloderma frenatum, *Peters, Bericht.* 1859, p. 216.
Cyclanosteus frenatus, *Peters, MS.* 1848.
Gray, Cat. Tortoises Brit. Mus. 1855, p. 64; *Proc. Zool. Soc.* 1860, p. 314.
? Aspidochelys Livingstonii, *Gray, Proc. Zool. Soc.* 1860, p. 5, t. 22, and p. 316.

"As the head of the *Aspidochelys* is not known, and the colour of the head forms one of the best characters for the separation of the species of *Trionychidæ*, we cannot refer the Zambesi species to the Zanzibar animal with certainty until an entire specimen of the former animal has been examined; but, at any rate, it appears to be a species of the genus *Cyclanosteus* of Dr. Peters, restricted as I propose."—*Gray, l. c.* vii. 226.

Fam. II. TRIONYCHIDÆ.

The margin of the disk expanded, without any internal bones. Head subtrigonal; eyes subsuperior, median. Skull solid, subtrigonal; nose moderate; eyes lateral; forehead short, not longer than the face; palate concave, with a well-raised alveolar ridge, and a deep pit more or less before and behind the internal nostrils.

Trionychidæ, section 1, *Gray, P. Z. S.* 1869, p. 212.

Synopsis of the Genera.

A. *The sternum contracted behind, without any flaps covering the hind legs.*

a. *Nostrils small, far apart, on the sides of the end of the proboscis.*

1. **Amyda.**

b. *Nostrils moderate, circular, close together in the middle of the end of the proboscis, with a small lobe on the inner side.*

† *The front and sides of the lower jaw with a broad, expanded, flat or slightly concave alveolar surface. Head short, forehead convex.*

α. Sternal callosities six.

2. **Landemania.** Anterior palatine groove deep.

β. Sternal callosities four.

3. **Trionyx.** Head short; forehead convex. Anterior palatine groove broad, shallow. Alveolar surface of the lower jaw broad, as wide in front as on the sides, rather concave, with a central longitudinal ridge in front.—Asia.

4. **Fordia.** Head short; forehead convex. Anterior palatine groove narrow, linear, deep. Alveolar surface of the lower jaw very broad, as wide in front as on the sides, flat, granular.—Africa.

5. **Barbieria.** Head rather elongate. Anterior palatine groove (in beak) narrow, deep, gradually becoming wider behind

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(in skull). Alveolar surface (of beak) in lower jaw regularly concave and smooth in front, and slightly concave on the sides. Odd anterior bone of dorsal disk free and smooth in the young specimens.

γ. Sternal callosities two, lateral.

6. **Aspilus.** Head oblong, elongate. Alveolar surface of the upper jaw wider behind; of the lower jaw broad, rather wider in front than on the sides, flat, with a slight concavity on the outer and convexity on the inner side behind. Central anterior palatine groove in the beak narrow, linear, deep, in the skull narrow, elongate, but very slightly marked; the front of the palate is very deeply concave to the front edge of the internal nostrils, and then bent up on the sides of them. Internal nostrils oblong.

7. **Rafetus.** Head broad; forehead convex. Skull rather longer than broad at the ears. Anterior central palatine groove broad and shallow, rather broader behind than in front. Alveolar surface of the jaws narrow, linear, in the upper jaw scarcely wider in front than behind; in the lower jaw rather wider in front, smooth, slightly concave on the sides, with an oblong slight concavity on each side; the concavity behind the internal nostrils deep, and rather narrower behind. Internal nostrils large, circular.

†† *The front of the lower jaw with a shelving inner surface and a narrow sharp alveolar edge, and with a more or less dilated concave alveolar surface on the sides, rather narrow behind.*

a. Face short, rounded; forehead convex; anterior central longitudinal palatine groove narrow, deep, short. Sternal callosities four.

8. **Potamochelys.**

β. Face tapering on sides, narrow in front; forehead shelving. Anterior central palatine groove broad and shallow; internal nostrils oblong, large.

* *Sternal callosities two, narrow.*

9. **Dogania.** Head broad; face very short, narrow in front. Skull depressed, not bent down in front. Sternal callosities two, lateral and narrow.

** *Sternal callosities four, large, lateral and anal.*

10. **Platypeltis.** The head oblong, very depressed; face moderate, rounded in front. Alveolar surface of the lower jaw broad, flat in front, rather wider behind, with a deep central longitudinal groove.

11. **Tyrse.** Head elongate; face elongate conical, narrow in front; forehead shelving. The alveolar surface of the lower jaw rather broad, with a shelving concavity on the upper surface in front, and with a sharp alveolar edge, which is rather wider.

12. **Callinia.** Head small; face short, tapering in front. Anterior palatine groove (in head with beak) narrow, linear, deep. Alveolar edge of the beak and upper jaw narrow, linear, tapering behind; of the lower jaw rather wide, shelving inwards, with a sharp edge in front, and narrow, short, and tapering to a point behind. Sternal callosities four, lateral and anal.

B. *Sternum dilated behind, with a flap on each side covering the hind legs.*

† *The front alveolar edge of the lower jaw narrow and sharp, the hinder edge dilated.*

13. **Tetrathyra.** Sternal callosities four; lateral large, transverse, broad; anterior small, round and separate.

14. **Cyclanosteus.** Sternal callosities nine: two anterior, close together, four lateral, three posterior.

†† *The front and lateral edges of the lower jaw broad, expanded.*

15. **Baikiea.** Sternal callosities 15 or more.

A. *Sternum contracted on the sides behind, without any moveable flaps covering the hind legs.*

a. *Nostrils small, on the sides of the end of the proboscis, separated by a wide space without any lobe on the inner side.*

1. AMYDA.

Nostrils small, simple, circular, far apart, rather on the underside of the snout. The alveolar edges of the lower jaw sharp all round. Palate not observed.

Amyda, *Agassiz, Contrib.* (not *Schweigger* nor *Fitzinger*; not Emyda, *Gray, Syn. Rept.*).

1. Amyda mutica.

Trionyx muticus, *Gray, Cat. Shield Rept.* 69.
Amyda mutica, *Agassiz, Contrib.* 394, t. 6. f. 6 & 7.

Hab. N. America.

"Eyes near; pupil black; iris pale lemon-colour, with a dusky bar."—*Holb.* ii. 19.

Lesueur and Holbrook point out a distinction in the form of the nostrils of *Trionyx ferox* and *T. muticus*. In the former they say the nostrils are anterior and closely approximated; they are subround, the greatest extent being in the vertical direction, and their longest axes are parallel to each other. Pupil black, with an interrupted black band. In *T. mutica* the nostrils are large, closely approximated, and of an elliptical form, the larger portion below, and the long axes of the ellipses converging from below upwards and forwards. Agassiz, on the other hand, figures the nostrils of the four species he describes; he represents the nostrils of *Aspidonectes spinifer*, *A. emyda*, and *Platypeltis ferox* as large, close together, with a small lobe on the inner side

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of each (t. 6. f. 1, 3, 4), and those of *Amyda mutica* as very small, far apart, being separated by a broad central space and on the outer edge of the snout (t. 6. f. 7). All the African and Asiatic species that I have been able to examine have the nostrils large, like the first series of species.

b. *Nostrils moderate, circular, close together in the middle at the end of the proboscis, separated by a narrow septum, and with a small lobe on the inner edge of each.*

† *The front and sides of the lower jaw with a broad expanded flat or slightly concave alveolar surface. Head short; forehead convex.*

a. Sternal callosities six.

2. LANDEMANIA.

Head elongate; the odd bone in front of the dorsal shield in adult specimens pitted, and united to the first costal by a straight suture. Sternal callosities six—two sternal, two lateral, and two anal; the sternal pair narrow, transverse, and not developed until the animal is nearly adult. Jaws strong; alveolar surfaces broad in front and on the sides, rather broader on the sides behind, that of the lower jaw shelving inwards. The anterior central palatine groove deep, narrow in front, and wider behind.

Landemania, *Gray, P. Z. S.* 1869, pp. 212 & 215.

1. Landemania irrorata. B.M.

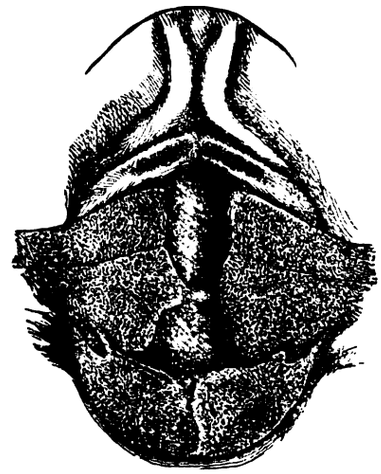
Head and body closely speckled with minute white dots; the chin and underside of the throat with rather larger but similar white spots.

Landemania irrorata, *Gray, P. Z. S.* 1869, pp. 212 & 216, fig. 18.
Trionyx peroculatus, *Günther, MS. in B.M.*

Hab. China.

A specimen (which had been allowed to get dry) now in spirit, from Shanghai:—Head black (face without any diverging lines), with very small white speckles very close together, and most of the same size and form, of underside (if any difference) very slightly larger; the skin of the back similarly and equally minutely white-dotted. Sternal callosities six; the anterior pair narrow, band-like, transverse, in the centre of the front of the sternum; lateral callosities narrow in the middle, very broad at the inner end; the anal broad, subtrigonal, united in the middle line by a truly dentated suture.

Fig. 31.



Landemania irrorata. Sternum.

2. Landemania? perocellata. B.M.

Head olive, with diverging brown lines from the eyes and across the forehead; chin and throat with large white spots.

Trionyx perocellatus, *Gray, Cat. Tort. B. M.* 48; *Cat. Sh. Rept.* 65, t. 31.
Landemania? perocellata, *Gray, P. Z. S.* 1869, p. 216.
Potamochelys? perocellatus, *Gray, P. Z. S.* 1864, p. 86.

Hab. China and Chusan.

A specimen in spirit, received from Mr. Swinhoe, from Formosa:—The front of the lower jaw with a flat triangular alveolar surface; the central groove in the palate before the internal nostrils narrow, deep, wider (sublunate) quite in front. Forehead with a narrow interrupted dark line from the front canthus of one eye to the other. Face with five diverging brown lines from the underside of the eye—the three front to the lower lip, the two hinder from the hinder canthus of the eye across the temple. Sternal callosities four; the hinder pair subtrigonal, with the angles rounded, and well separated. Sides of lower jaw,

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chin, and throat with large, symmetrical, but different-shaped white spots.

A stuffed half-grown specimen in the British Museum, from China:—The bony dorsal disk oblong; the front odd bone united to the first costal by a straight edge, and rugose like it, with a very small pit on each side of the middle of the hind edge; the front edge with a few tubercles in the centre; the hinder flap with roundish tubercles. Sternal callosities four; lateral narrow on the sides, much wider in the middle; the hinder callosities ovate, oblique, with short convex sides and rounded ends. Head moderate; alveolar surface of the jaws broad, rather broader behind; the anterior central palatine groove deep, wide, and rather wider behind.

β. Sternal callosities four, large, lateral and anal.

3. TRIONYX.

Skull oblong, swollen. Nose convex, arched. Forehead convex. Upper jaw with a broad, flat, rugose alveolar plate, which is narrow in front and wide behind. Lower jaw with a broad, deeply concave alveolar edge, which is of nearly equal width in all parts, and with a slight prominence in the middle of the hinder edge. Palate with a broad, deep concavity, which is nearly as wide before as behind, and with the large oblong internal nostrils in the hinder part of the palate, and a deep groove, separated by a longitudinal ridge, behind each of them; internal nostrils in a line with the front of the zygomatic arches. Sternal callosities four, well developed. The anterior odd bone of the dorsal disk in the young animal with a pitted surface, separate, but becoming in the older animal united to the dorsal disk by a linear suture.

"The nostrils rather small, far apart, with a lobe on the inner side. Pupil circular."—*Wagler.*

Trionyx, *Gray*, *P. Z. S.* 1864, p. 81, 1869, pp. 212, 217.

"The flesh of the highly carnivorous soft Turtles may be palatable."—*Theobald.*

1. Trionyx gangeticus. B.M.

Head short, broad (about as long as broad at the ear-bone), rounded in front; the alveolar surface of the lower jaw concave, with sharp raised inner and outer margins, and an indistinct short central ridge on the inner side of the front; the central palatine groove in front of the internal nostrils very wide, as wide in front as behind.

Trionyx gangeticus, *Cuvier*, *R. A.* ii. 16.
Gray, *Cat. Sh. Rept. in B. M.* 66; *P. Z. S.* 1864, p. 81, 1869, p. 217.
Theobald, *Journ. Linn. Soc.* x. 1868, p. 18.
Aspidonectes indicus, *Fitz.*
A. gangeticus, *Wagler*, *N. Syst. Amph.* t. 2. f. 13–18 & f. 20.

Hab. India, Ganges; Pegu (*Theobald*).

Cuvier figured the skull (Oss. Fos. v. 187, t. 11. f. 5–8); and it is also figured in the 'Cat. of Shield Rept. in B. M.' (t. 42. f. 1). Wagler figured some part of the skeleton (N. Syst. Amph. t. 2. f. 13–18 & f. 20).

Three halfgrown specimens, in spirit, in the British Museum:—Back dotted with dark brown, and with four eyed spots; crown brown, with a large oblong white spot on each side of the temple, just at the back end of the eye, with large, oblong, oblique white spots on each ear; a triangular spot on the back part of the upper lip, a large oblong white spot occupying the greater part of each side of the chin; neck with small white spots on the upper, and larger ones on the lower side; legs and feet white-spotted; sternum with small white spots, especially on the front margin.

Var. Back with six eyed spots, the hinder pair smaller; the colour of the specimen appears to be very uniform, only differing a little in the size of the spots; the large spot on the temple is well marked in all the specimens I have seen.

2. Trionyx Jeudi. (Fig. 32.) B.M.

The head rather elongate (rather longer than the breadth at the ears), rather tapering in front. The alveolar surface of the lower jaw as wide in front as on the sides, slightly concave, with a central longitudinal ridge across the front, and with a slight concavity on each side; the central anterior palatine groove shallow, narrow in front and wide behind.

Trionyx Jeudi, *Gray*, *P. Z. S.* 1869, p. 217, fig. 19.

Hab. Java? From the Museum of Prof. Lidth de Jeude.

This species is described from a fine adult skull received from the Utrecht Museum, which, no doubt, was obtained from some of the Dutch colonies. It is most distinct from the Indian species. I have named it after the Professor who formed the Museum. The front longitudinal ridge is very distinct in the jaw-bone, almost more so than in the horny beak of the jaw. The front of the jaw of the *T.*

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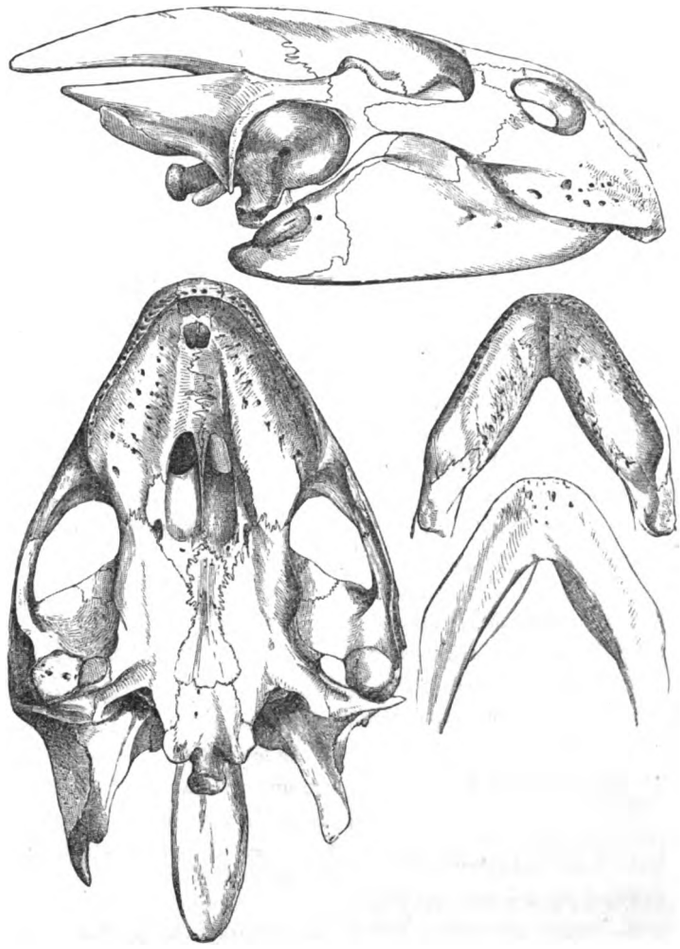
gangeticus is simply concave, without any indication of a ridge, but only a slight prominence on the inner part of the inner edge; and the alveolar surface on the sides of the lower jaw is flat and with a deep oblong concavity on each side.

In the British Museum there is the head of an adult animal in spirit that was purchased of Mr. Theobald, who obtained it in Pegu. It has the narrow central anterior palatine groove and the cylindrical ridge across the front of the lower beak of this section of the genus; but the ridge is only slightly raised and is very different from that in the skull from Utrecht.

Fig. 32.



Trionyx Jeudi.

Mr. Theobald, in his "List of Reptiles of British Burma," printed in the Journal of the Linnean Society for 1868 (vol. x. 4), mentions a new species of *Trionyx*, from Pegu, under the name of *Trionyx Phayrei*; but the species is so very briefly and imperfectly described that it is impossible to determine how it differs from the other Indian species; and as he states that various species of the genus are found in Pegu, the habitat will not, as it sometimes does, make up for the imperfection of the description. *T. Phayrei* appears to have been described from a single, nearly adult specimen; so the characters and coloration of the young one are not given, and probably not known.

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3. Trionyx formosus. B.M.

The back shield olive, with four very large black eyed spots, the central spot circular, black, with a narrow white margin, and a dark brown ring close to it, which is surrounded by a larger pale brown ring, separated from the inner one by a broad olive space. The outer ring forms part of a regular series of netted dark lines, which are symmetrical on the two sides of the keel, forming a large open space in the middle of the back, and a smaller one near the margin and on the hinder part of the disk. The sternum and the underside of the margin of the disk sooty grey, paler in parts, with a white edge on the margin of the shield. The upperside of the limbs olive, with small white spots. The head and back of the neck olive, varied with black-edged white spots, which are of various sizes, but symmetrically disposed on the two sides. There is a small oblong white spot on each temple, an irregular larger white spot just before the angle of the mouth, a large white spot below on each side, a larger spot in the centre of the hinder part of the gullet, and a series of small white spots on the flap of the upper lip. The hinder part of the head is encircled by a broad black-edged white band or collar, which is interrupted by a small olive spot in the middle of the back of the neck. The collar is broader and more diffused on the sides of the throat; it gives off a horizontal streak from its hinder side nearly as broad as itself, which is extended for a short distance on the sides of the neck. The alveolar surface of the upper jaw wide the whole length of the outer edge; the groove in front of the palate narrow and elongate, the internal nostrils subcentral. The alveolar surface of the lower jaw broad and slightly concave.

Trionyx formosus, *Gray*, *P. Z. S.* 1869, p. 217, t. xv. fig. 1.

Hab. Pegu.

In its young state this *Trionyx* is one of the most ornamental species, the dorsal shield being decorated with four large eyed spots, each surrounded by several concentric rings of different width, and the white interrupted collar on the neck is very striking. It has the four large spots on the dorsal shield so common in the young state of *Trionyx gangeticus*, figured in my 'Illustrations of Indian Zoology' as *Trionyx ocellatus*, which is copied from Dr. Buchanan Hamilton's drawing of *Testudo ocellata*. But in this species and in the more advanced state of the young animal figured in my 'Indian Zoology' as *Trionyx hurum*, from another of Dr. Buchanan Hamilton's drawings, there is a yellow spot on each temple just behind the eyes; while in *T. ornatus* the temples are olive, and the white collar is much further back—as far from the back edge of the eyes as the eyes are from the tip of the nose.

The upper part of the head is olive, very closely and minutely dotted with black; the underside is uniform greyish white. The nostrils are very close together, with a slight lobe on the inner side of each.

4. Trionyx? peguensis.

Head, in spirit, pale olive-green, minutely and closely punctulated with black; the upper lip, lower part of the sides of the head, sides of the neck, chin, and throat uniform greyish white; the lower margin of the flap of the upper lip opaque white; the rest of the animal unknown.

The nose rather produced; nostrils circular, close together, only separated by a narrow space, and with a small process on the middle of the inner side of each; the tympanums are quite hidden from view, because they are covered with skin, like the rest of the head; and the skin over and near them is closely and minutely transversely wrinkled; the eyes are rather in front of a line even with the angles of the mouth.

Length of head 3½ inches, from end of occipital crest to back of orbit 2½, front of orbit to front edge of upper beak 11 lines; width over tympanum 2¼ inches.

Hab. Pegu.

In Mr. Theobald's collection is the large head of a well-grown specimen of the genus *Trionyx*, from Pegu, which is very different from any species that has before come under my notice, and which indicates the existence of a species not before catalogued.

4. FORDIA.

Head short, broad; face short, forehead convex. Anterior palatine groove narrow, linear, deep. Alveolar surface of the beak of the upper jaw very wide, flat; of the beak of the lower jaw very broad, as wide in front as on the sides, acute, flat, granular, with a very indistinct indication of a longitudinal central ridge. The hinder pair of costals about half as broad as the pair of costals before them. Skull ——?

Hab. Africa.

Fordia, *Gray*, *P. Z. S.* 1869, pp. 212 & 219.
Petherick, Journey in Central Africa.

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Known from *Trionyx* by the flatness and width of the alveolar surface of the beaks. I have named this genus after Mr. Ford, who has illustrated so many of my papers.

1. Fordia africana. B.M.

The head and neck (and most likely the other parts of the body, limbs, and dorsal shield) olive, minutely and regularly speckled with small white spots. The hinder sternal callosities triangular, rather longer than wide, straight in front and on the inner side, very acute behind.

Fordia africana, *Gray*, *P. Z. S.* 1869, p. 119.
Petherick, *Journ. Central Africa*, p. .
Tyrse nilotica, var., *Gray*, *P. Z. S.* 1864, p. 88.

Hab. Upper Nile, Chartoum (*Petherick*, adult male and female in the B. M.).

These specimens are those referred to as having been sent from Chartoum by Mr. Petherick in the account of *Tyrse nilotica* in the P. Z. S. 1864, p. 88, where they were regarded as being specimens of the common Nilotic Mud-Tortoise; but the examination of the alveolar surface of the jaws at once showed that they had no affinity with that genus, but must be more allied to the Gangetic *Trionyx*; and then I observed that they had the shorter face of that group, which character had been previously overlooked. The alveolar surface of both jaws is very wide, nearly flat (not concave in front as in *Trionyx gangeticus*). The species is, no doubt, peculiar to the Upper Nile, and had not been before observed.

The examination of the alveolar surface of Du Chaillu's specimen, which had been named *Aspidonectes aspilus* by Mr. Cope, showed that it was (as I had previously determined it to be) identical with *Tyrse nilotica* of the Lower Nile. The head and neck of this large specimen, when the skin was wet, showed that it was speckled with white, like the true Nilotic Mud-Tortoise, *Tyrse nilotica*. The sternal callosities rather differ in form from those of *T. nilotica*; the hinder ones are larger, and more acute behind. The last of the ribs are also wider, compared with the others, than in that species.

A young specimen in spirit, from the Upper Nile, obtained from Mr. Petherick, probably belongs to this species. The head, neck, feet, and dorsal disk covered with close, small, dark-edged, annular white spots, those on the sides of the head and, especially, on the chin and throat being rather the largest.

5. SARBIERIA.

Head rather large; eyes lateral, subsuperior. Jaws strong; alveolar surface (of beaks) broad, broader and more dilated behind, surface shelving inwards,—of lower jaw deeply concave, smooth, and with a sharp edge in front, and slightly concave on the sides. The central anterior palatine groove narrow and deep, with a short slight dilatation in front and with rather diverging sides behind. Dorsal disk small. Costal bones separate. Front odd bone in the young and half-grown specimens separate, broad, transverse, and with a smooth upper surface. Sternal callosities four; lateral narrow on the outer side; anal ——?

Sarbieria, *Gray*, *P. Z. S.* 1869, pp. 212 & 220.

This genus is in many respects allied to *Dogania*; but it appears to have four callosities, and the upper surface of the back is concave; it is narrow in front, and wider behind. But it is difficult to compare a head with the beak on with a prepared skull without a beak.

1. Sarbieria frenata. B.M.

Trionyx frenatus, *Gray*, *Cat. Sh. Rept.* 67.
Potamochelys? frenatus, *Gray*, *P. Z. S.* 1864, p. 87.
Sarbieria frenata, *Gray*, *P. Z. S.* 1869, pp. 212 & 220.

Hab. Singapore (*Wallace*).

A stuffed specimen in the British Museum, "of a young female with full-sized eggs," from Mr. Wallace. The odd bone in front of the dorsal disk entirely covered with the skin, and smooth. The sternal callosities are scarcely developed, only showing a slight roughness on the surface. Head olive, with a black central streak from the snout to between the eyes, which divides behind into three diverging streaks on the crown and nape; a streak from the nose, through the eye, and continued on the temple, to the side of the neck. The alveolar surface of the upper and lower jaws very broad the whole length of the outer edges; the alveolar surface of the upper jaw is so large as to cover the greater part of the palate, much more so than in *Trionyx gangeticus*; in the lower jaw it is very broad, as broad behind as before, and slightly concave. The central palatine groove in front of the internal nostrils narrow, deep. The bones of the dorsal shield are distinctly marked and separate; the vertebral plates are very narrow, nearly twice as long as broad; the costal ones are linear, scarcely broader at the outer ends, the last one being the least and narrow at the outer end. The odd bone in front is quite separate from the granular buckler, covered with skin, and quite

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smooth. The lateral sternal callosities are scarcely developed, only showing a slight roughness on the surface. The hinder pair of sternal bones are broad at the inner end and united together in front of the inner edges by two broad lobes.

Very like the figure in Cuvier's 'Ossemens Fossiles,' v. t. 23. f. 5.

γ. Sternal callosities two, lateral.

6. ASPILUS.

Head elongate, rather depressed. Skull elongate; forehead convex, short; orbits submedian. Nose shelving, rather convex. The palate slightly concave, with the hinder sides under the orbits rather expanded; narrowed in front, with a narrow deep concavity; grooves of equal width in front of the internal nostrils. The internal nostrils oblong, subposterior, on a level with the front edge of the zygomatic arches, with a deep elongate groove behind each of them, separated by a central longitudinal ridge. The alveolar surface of the upper jaw broad, shelving outwards; the inner edge forming a ridge on the side of the inner nostrils. The lower jaw shallow in front, with a broad flat alveolar surface, with a sharp simple outer edge, and shelving internally. Sternal callosities two, lateral.

Aspilus, *Gray*, *P. Z. S.* 1864, and 1869, p. 212 & 221.

The skull of this genus is figured by Wagler (N. Syst. Amph. t. 2. f. 4–9) as *Aspidonectes javanicus*.

The odd bone in front of the dorsal shield in the younger specimen is separate, and smooth on the upper surface, and it becomes pitted and united to the costal by a straight suture in the adult animal, with a small pit on each side, which may be filled up in older specimens.

"Pupils circular, without any lateral spots."—*Hardw.* Three figures of different ages.

Head spotted.

1. Aspilus cariniferus. (Fig. 33.) B.M.

Trionyx cariniferus, *Gray, Cat. Sh. Rept. B. M.* 67, t. 32.
T. stellatus, *var.* javanicus, *Schleg. Faun. Japon. Chelonia*, t. 5. f. 6 (head?).
? Aspidonectes javanicus, *Wagler, N. Syst. Amph.* t. 2. f. 1, 12 (skeleton and skull).
Aspilus cariniferus, *Gray, P. Z. S.* 1864, figs. 4–6 (skull), 1869, p. 213.

Hab. Java.

Wagler, in his 'N. Syst. Amphib.' t. 2. f. 1, 12, figures a very young *Trionyx* under the name of *Aspidonectes javanicus*. It is not the *Trionyx javanicus* of Cuvier or of my catalogue. The head, neck, and body are minutely white-speckled; the chin and throat are varied with rather larger white spots, and the dorsal disk is speckled with white, as in *Potamochelys stellatus*; but he represents the dorsal disk as having six rings of white spots on the hinder part near the margin, which I have never seen in this species. Hence it is probably the young of a species that has not come under my observation.

A well-grown stuffed specimen from the Utrecht Museum, probably from one of the Dutch Asiatic colonies. The odd bone of the dorsal disk rugose and united with the front rib by a straight suture, and with a small circular pit on each side of the centre; sternal callosities rugose, lateral elongate, linear, truncated at each end, and rather wider at the outer end. Head olive, with many white spots, those on the chin and underside of the neck rather larger and less numerous, but without any particular larger spot.

A stuffed middle-sized specimen in the British Museum. Sternal callosities not developed. Obtained at Sarawak by Mr. Wallace. Head dark, with very obscure white spots; dorsal disk very rugose, very obscurely keeled, with longitudinal ridges, and with three or five diverging, acute, expanding ridges on the hinder part of the flap. The odd bone smooth, broad, short, attached to the first vertebral by a small central prominence and by the inner surface of the outer ends; the alveolar surface of each jaw broad, considerably broader behind, rather concave in front; the central anterior palatine groove (before the inner nostrils) deep, rather narrow.

This specimen has been considered to belong to *Trionyx ornatus* by Dr. Günther in his work on Indian Reptiles.

Specimen in spirit. Head olive, darker on the crown, with numerous regularly dispersed, equal-sized white spots, those on the upper part of the head smaller, of the sides of the head rather larger; of the chin and throat few, further apart and much larger, generally oblong, as if formed of two united large spots, these large spots on the neck symmetrically dispersed; the dorsal shield dark olive or blackish, with numerous small, close, white spots, especially on the sides and hinder part; legs and feet dark olive, with small white spots.

Two specimens in spirit from the Dutch Museum; the one very young and the other half-grown. The dorsal shield very dark olive-brown, with very many minute white spots; the head dark, white-spotted, these spots

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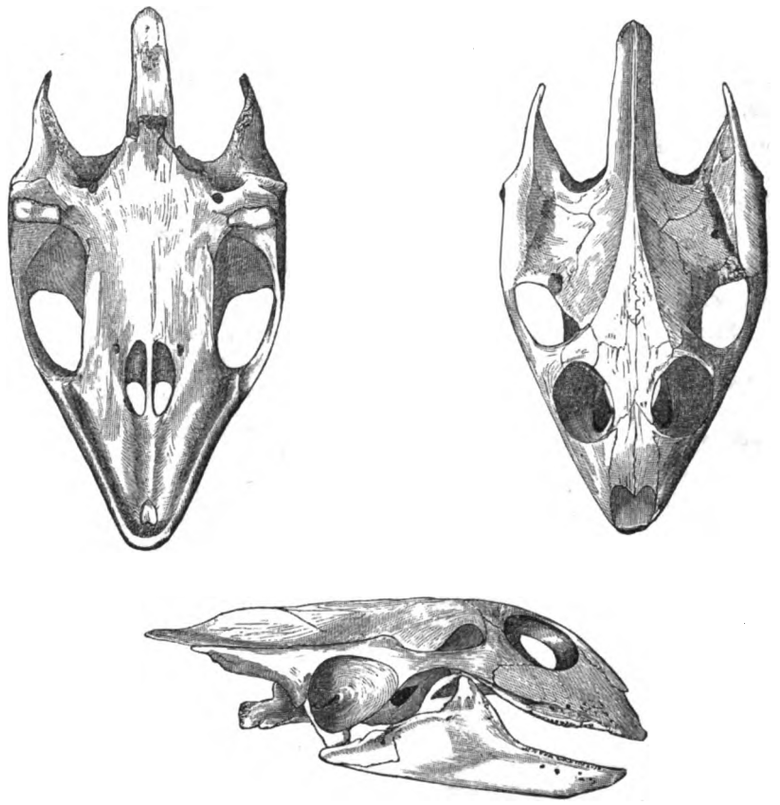
on the crown and nose small, of the cheeks and sides of neck larger, and of the chin much larger, fewer, symmetrical; the spots are all without the distinct black margins found in *Tyrse nilotica* and same other species.

Two young specimens of *Aspilus cariniferus*, in spirit, presented to the British Museum by L. L. Dillwyn, Esq., from Borneo. The larger has the head, legs, and back brown; the sternum and the underside of the margin is whitish yellow, with a large, dark-edged, opaque-white spot on each side in front of the opening from the hinder leg; the crown, face, including the lips and chin, are brown, with small-sized regular roundish white spots; the temples and throat with larger white spots, which are often oblong. The younger one is more bleached.

A fine skeleton of this animal presented by Dr. Leith, from Poonah. The alveolar surface of the upper jaw wide the whole length of the outer margin; lower jaw weak, with a sharp edge, and narrow shelving alveolar surface, the whole of the length of the outer edge, only slightly wider behind; the central palatine groove in front of the internal nostrils narrow, deep.

Fig. 33.



Aspilus cariniferus.

2. Aspilus? punctulatus. B.M.

Dark grey-brown; back of the shield with numerous minute white specks, and a narrow thin white margin; beneath white. Head dark, with minute white specks above, and larger white spots on the chin and throat, with a large irregular-shaped spot on the side of the neck behind the angle of the gape; the specks and spots on the head regularly dispersed; sternal callosities not developed.

Aspilus? punctulatus, *Gray*, *P. Z. S.* 1864.
Trionyx cariniferus, spec. *d* & *e*, *Cat. Sh. Rept. B. M.* 67.

Hab. Amboina or Ceram (*Madame Ida Pfeiffer*).

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The youngest specimen has a darker head, with small, symmetrical brown spots on the crown and nape; the three on the nape larger and forming a cross line; the dorsal disk is brown, white-dotted, and the spots are more distinct than in the other, older specimens. I am inclined to regard this as only the young of *A. cariniferus*, as I first considered it.

3. Aspilus? ornatus. B.M.

Trionyx ornatus, *Gray*, *P. Z. S.* 1861, p. 41, t. 5; *Ann. & Mag. N. H.* 1860, vi. p. 218 (young), 1861, vii. p. 422.
"Trionyx javanicus, juv., *Dum. & Bibr.*" *Mus. Paris.*
Aspilus? ornatus, *Gray*, *P. Z. S.* 1864.

Hab. Camboja.

Young specimens, in spirit, from Siam have rudimentary *narrow, linear, band-like callosities on the lateral sutures of the sternum*. Head minutely white-speckled (no large spot at angle of the mouth); the first vertebral bone transverse, broad, with a prominence on the middle of the hinder edge; the hinder part of the disk with close large tubercles.

A stuffed young specimen from Sarawak, which appears to belong to the same species, has no indication of callosities. Head white-spotted, like young specimen from Siam. The first vertebral bone separate, transverse, smooth, not rugose. The hinder part of the disk smooth, with a central elongated streak, and two oblique converging short lines of small tubercles.

Back (of young animal from Cambogia, in spirit, received from M. Mouhot) brown, with large, unequal-sized, irregularly disposed, black, circular spots. Head olive, with symmetrical small black spots on the chin, forehead, and nose; throat and sides of neck with large, unequal-sized, irregular-shaped, but nearly symmetrically disposed yellow spots. Legs olive-yellow, spotted in front. Sternum and underside of margin yellow; sternal callosities not developed.—*Ann. & Mag. N. H.* 1860, vi. 218.

The species is very distinct in its colouring from the young of any of the other Indian species; and the colouring of the young animal forms one of the best characters of the species of the genus. It is most like the young of *T. gangeticus*; but the dorsal spots are solid, not rings, and the head is olive, dotted with black.

Stuffed specimen from the Lao Mountains, collected by M. Mouhot. Dorsal disk small, free part of the ribs bony; the odd front bone entirely covered with skin, smooth, or with some very obscure indications of rudimentary tubercles in the middle. The bony dorsal shield bluntly keeled; front edge with a series of large tubercles; the hinder part of the flap with numerous acute tubercles; sternal collosities not developed—only a very slight, indistinct ridge on the side of the transverse suture of the lateral bones. The head indistinctly white-spotted. The alveolar surface of the jaws broad, rather broader behind. Central anterior palatine groove wide and deep.

A rather larger, stuffed specimen collected by the same person, at the same time, is similar in almost all the characters. The head is more distinctly white-dotted; there are a few spots on the side of the throat that are rather larger than those on the crown; the legs are marked with small white spots. Dorsal disk warty in front, and with narrow acute warts behind; the bony dorsal disk subcircular, rugose. The odd front bone covered with the skin, smooth, with some obscure indications of tubercles on the middle in front of the dorsal keel. The sternal callosity rudimentary, just commencing over the transverse suture of the lateral bones. Head moderate; alveolar surface of the jaws broad, rather broader behind; the central anterior palatine groove before the internal nostrils deep, rather broader behind.

7. RAFETUS.

Skull oblong, swollen. Nose convex, arched. Forehead flat. Upper jaw with rather broad, rugose alveolar plates, rather wider behind than in front; lower jaw with a rather broad, slightly concave alveolar edge, which is rather wider in front. Palate concave, with a broad, deep concavity, which is rather narrower in front than behind the internal nostrils; internal nostrils large, oblong, in a line with the middle of the lower edge of the orbits, and a deep groove, separated by a central longitudinal ridge, behind each of them. Sternal callosities *two*, lateral, small.

The skull of this genus is very similar to that of the genus *Trionyx*, as now restricted; but it is at once known from that genus by the absence of the hinder sternal callosities and the small size of the lateral ones, and in the internal nostrils being more anterior, and the front of the palate wider.

Rafetus, *Gray*, *P. Z. S.* 1864, & 1869, p. 213.

In the nearly adult animal the odd anterior bone of the dorsal shield is pitted and attached to the first costal by a straight suture, with a small circular pit on each side of the centre; the lateral sternal callosities are wide and long, more or less developed; the hinder sternal bones are quite smooth and rather small.

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1. Rafetus euphraticus. B.M.

Trionyx rafeht, *Gray, Cat. Sh. Rept.* 65, t. 30.
Tyrse rafeht, *Gray, Cat. Tort. Brit. Mus.* 49.
Testudo rafeht, *Olivier, Voy. Pers.* ii. 452, t. 11.
T. euphraticus, *Daud.*
Trionyx euphraticus, *Geoffr.*
Rafetus euphraticus, *Gray, P. Z. S.* 1864, & 1869, p. 213.

Hab. Tigris and Euphrates.

In the 'Catalogue of Shield Reptiles,' p. 65, I noted that the skull is much shorter and broader than that of *T. niloticus*.

"Trionyx euphraticus, *Geoffr.*," *Giebel, Zeitschrift für. ges. Natur.* 1868, p. 20.

Hab. Island of Banka.

Probably a new species.

†† *The front of the lower jaw with a shelving lower surface and a narrow oblong alveolar edge, and with a more or less dilated concave alveolar surface on the sides, rather narrow behind.*

a. *Face short, rounded; forehead convex; anterior central longitudinal palatine groove narrow, deep, short. Sternal callosities four.*

8. POTAMOCHELYS.

The alveolar surface of the upper jaw convex, shelving outwards, elongate, only slightly wider behind; of lower jaw rather wide, concave, and shelving inwards in front, rather dilated on the hinder half of the sides, with a slightly shelving oblong concave surface. The upper jaw bent down in front; the palate flat behind; the central anterior palatine groove narrow, deep, short; internal nostrils oblong, anterior, in a deep cavity, partly hooded by the alveolar surfaces of the upper jaw, and with an elongate deep concavity behind each.

Head elongate, rather depressed; nose rounded; forehead flat; orbits submedian. Sternal callosities four. The palate of the skull rather convex behind, with a slight expansion on each side under the orbits, concave, contracted and bent down in front, with a short, very narrow, deep groove of equal width in front of the internal nostrils. The internal nostrils median, large, oblong, hooded over by the dilated side of the alveolar plates, and with a very long deep groove behind each of them. The alveolar surface of the upper jaw rather convex in front, shelving outwards behind, and with a raised inner edge, which hoods over the cavity of the internal nostrils. The lower jaw low and produced and with a simple sharp edge in front, and a subtrigonal, elongate, flattened, rather concave alveolar disk occupying the hinder half of the inner side.

Potamochelys, *Gray, P. Z. S.* 1864, & 1869, p. 213.

The odd anterior bone of the dorsal disk in the young animal is pitted on the surface and separate, but in the older ones it is united to the dorsal disk by a straight suture. The skull resembles that of *Cyclanosteus*.

The sternal callosities are developed in the young specimen; but in this animal the lateral ones are oblong, transverse, and the anal ones roundish, occupying all the centre of the bone; the rugose surfaces on the odd anterior dorsal bone in the young specimen are roundish or oblong transverse.

1. Potamochelys stellata. (Skull, fig. 34.)

Trionyx javanicus, *Geoff. Ann. Mus.* xiv. 15, t. 3.
Gray, Cat. Sh. Rept. 67.
Potamochelys javanica, *Fitz.*
P. stellata, *Gray, P. Z. S.* 1864, p. 85, f. 7, 8 (skull), & 1869, p. 213.
? Trionyx coromandra, *Wagler, N. Syst. Amph.* t. 2. f. xxiv. (skull).
T. stellatus, *Geoff. Ann. Mus.* xiv. 13 (junior).

Hab. India: Deccan (*Sykes*).

Professor Wagler, in his 'N. Syst. Amph.' t. 2. f. xxiv. represents a skull of the genus as *Trionyx coromandra*.

I have changed the name of this species because it has been applied to a number of species on the Continent, and I have never seen a specimen from Java. It is known in the young state from all the other species by the broad black streaks radiating on the crown of the head; and they are to be seen in the half-grown specimens.

The following species, which has four sternal callosities, appears to belong to this genus, but I have not been able to examine any skulls of it.

The dorsal shield of the adult specimens is without any longitudinal ridge. The younger specimens have these ridges more or less strongly developed; they are highest in the youngest specimens, and are nearly parallel to each other.

A series of stuffed specimens, of various ages and sizes, is in the British Museum. One is an adult, with the odd anterior bone completely united to the front costal bone by a simple suture. The others have the rugosity of this bone in various states of development; but it is always separated, and the rugose part of the surface is always small compared with the adult.

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The young specimens in spirits in the British Museum are pale brown, with a row of four or five black spots with a narrow pale edge, edged with a narrow black ring down

Fig. 34.

Potamochelys stellata.

each side of the middle of the back. In one specimen there are found four spots on one side and five on the other: the spots on the two sides are nearly opposite to each other; and on the side where one is wanted the space is left vacant. These spots are much smaller than those of *Trionyx gangeticus* or *T. formosus*.

A very young specimen from Pinang, named *Gymnopus cartilagineus* by Dr. Cantor, in the British Museum:—The bony part of the dorsal disk is scarcely so long as the free part of the ribs, which are very slender; the bony part of the disk with two or three interrupted or nearly continuous longitudinal ridges, the latter being near the edge of the disk. The odd anterior bone is separate from the first costal, and is covered with skin, and smooth. Sternal bone without any callosities.

2. Potamochelys tuberculata. B.M.

Trionyx tuberculatus, *Cantor, Drawings.*
Gray, P. Z. S. 1861, p. 42; *Ann. & Mag. N. H.* 1861, vii. p. 422.
Potamochelys tuberculata, *Gray, P. Z. S.* 1864, p. 87.

Hab. Chusan.

Face moderately long, subconical, rather convex; forehead and crown flat (length from back of orbit to nose and to occiput the same), longer than in *P. stellata*; nostrils large, rather close, with a very small lobe on the inner side of each.

The neck of the young specimens with a dark-edged pale streak on each side, which is bent down towards the throat behind; head brown, black-speckled, with a narrow line across the forehead on the front edge of the eye.

"*Trionyx tuberculatus* of Dr. Cantor, from Chusan, appears, from a drawing by Dr. Cantor in the Indian Museum at Fifehouse, to be distinct from any of the other Asiatic species that have occurred to me. This drawing has eight large and four small white-edged black spots, placed in pairs, on the dorsal disk, the throat with a dark streak on the middle of each side; the chin yellow, black-dotted. The lateral sternal callosities are large, oblong, and the posterior one round."—*Gray, Ann. & Mag. N. H.* 1861, vii. p. 422.

See also:—

1. Trionyx Maackii, *Brandt, Bull. Acad. St. Pétersb.* xvi. 110, 1857; *Institut*, xxvi. no. 1288, p. 298; *Arch. f. Nat.* 1858, p. 63.

Hab. North China; Amoor River.

2. Trionyx Schlegelii, *Brandt, l. c.* 1857.
T. stellatus, *sive* javanicus, var. japonicus, *Schlegel, Fauna Japon.* t. 8 (animal), t. 5. f. 7 (head).

Hab. Japan.

β. Face tapering on sides, narrow in front; forehead shelving; the anterior central palatine groove broad and shallow; internal nostrils oblong, large.

* *Sternal callosities two, lateral, narrow.*

9. DOGANIA.

Head broad; face very short, narrow in front. Skull depressed, broad; underside of skull straight, not bent down in front. Anterior central palatine groove shallow,

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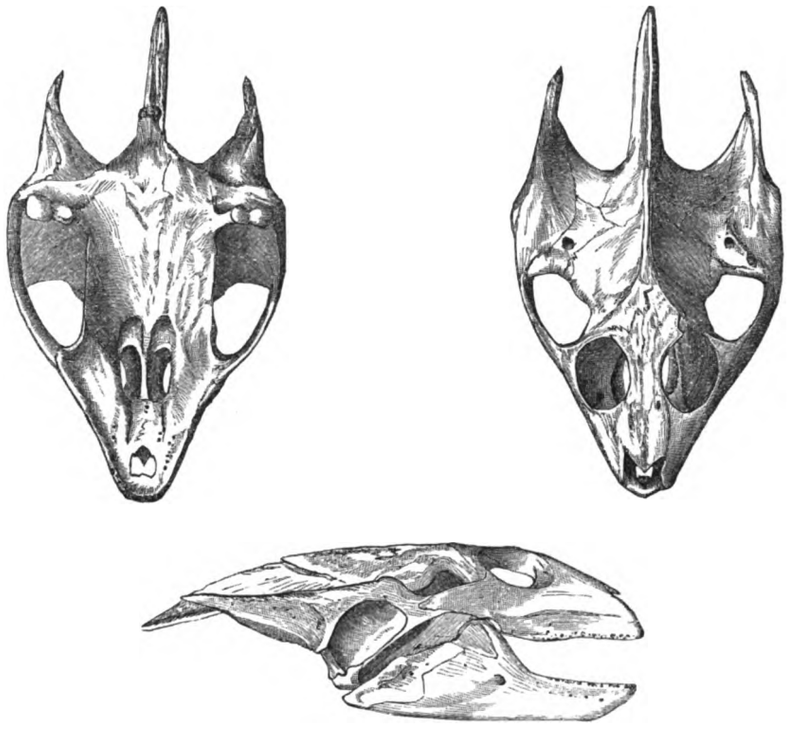
broad, rounded in front, very slightly narrowed behind. Alveolar surface of the upper jaw flat, broader behind; of lower jaw moderately broad, with a shelving upper surface and a sharp, simple alveolar edge, rather expanded and flattened out behind and slightly concave on the surface. Internal nostrils oblong, large, obliquely longitudinal, with a short concavity behind each. Sternal callosities two, lateral, narrow. The odd anterior bone transverse, narrow, slightly pitted like the costal, and separated from the first costal by a short space.

Dogania, *Gray, Cat. Tort. B. M.* 49, 1844; *Cat. Sh. Rept.* 69; *P. Z. S.* 1864, p. 82, & 1869, p. 213.

Fig. 35.



Dogania subplana.

Head depressed; skull depressed, wide behind. The nose of the skull shelving; the orbit large, subcentral. Forehead small, rhombic, not reaching to over the ear; occipital ridge very much produced, elongate. Palate concave, with a raised margin on each side behind, under the orbits, and with a deep concavity in front of the internal nostrils, which is dilated in front. The internal nostrils very large, oblong, with a short, deep concavity at the hinder edge of each, separated by a central longitudinal ridge. The upper jaw with a broad oblong alveolar plate on each side behind, edging the sides of the inner nostrils. The lower jaw rather produced in front; the front of the alveolar edge simple, sharp-edged, the hinder half rather flattened, broad, but shelving inwards. Sternal callosities *two*, lateral, linear.

"Pupils circular, without any lateral spots."—*Hardw.*

1. Dogania subplana. B.M.

Dogania subplana, *Gray, Cat. Tort. B. M.* 49; *Sh. Rept.* 69, t. 33; *P. Z. S.* 1862, p. 265, 1864, p. 83, and 1869, p. 213; *Ann. & Mag. N. H.* 1863, xii. p. 158.
Cuvier, Oss. Foss. ii. t. 13. f. 5 (dorsal disk).

Hab. China and Formosa. *Terrapin* of the Europeans in China. Sold to make soup.

The back, upper part of limbs and upper surface of the head dark brown or olive, in spirit, very closely and minutely punctulated with white dots, most distinct on the upper part of the head; the lips and chin with larger white dots; the throat and underside of the body and limbs pale yellowish white.

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2. Dogania Guentheri. B.M.

Dogania Guentheri, *Gray, P. Z. S.* 1862, p. 265, 1864, p. 83; *Ann. & Mag. N. H.* 1863, xii. p. 158.
Trionyx (Dogania) Güntheri, *Günther, R. B. I.* 49, t. vi. f. 4.

Hab. India.

Face of skull flat, shelving downwards; eyes close together; forehead flat.

** *Sternal callosities four, large, lateral and anal.*

10. PLATYPELTIS.

Head oblong, rather depressed; face moderate, rounded in front. Front of the palate with a very wide, shallow concavity, which is rather narrowed and rounded in front, and gradually dilated behind. Alveolar surface of the jaws flat, rather wider behind, of the upper jaw flat in front, rather wider on the hinder part of the sides, with a raised longitudinal subcentral ridge; of the lower jaw broad, flat in front, with a sharp front edge, narrow in the front part and rather dilated on the hinder part of the sides, with a deep central longitudinal groove. Sternal callosities four; the lateral ones twice as wide on the inner as on the outer side; the hinder triangular, front edge sinuous and wider than the length of the straight inner sides. *P. ferox.* (From Pennant's specimen.)

Platypeltis, *Fitzinger, Syn. Rept.* 30.
Agassiz, Contrib. 401.
Gray, P. Z. S. 1869, p. 214.

1. Platypeltis ferox. B.M.

Trionyx ferox, *Gray, Cat. Sh. Rept.* 68.
Platypeltis ferox, *Fitzinger, Syn. Rept.* 30.
Agassiz, 401, tab. vi. f. 3.
Gray, P. Z. S. 1869, p. 214.

Hab. North America.

Holbrook says the flesh is most delicate food, far surpassing even the green Turtle (*Chelonia mydas*).

The adult stuffed specimen that was formerly described by Pennant when it was in the museum of the Royal Society, is now in the British Museum.

The bony dorsal disk is oblong, rather longer than broad, with large irregular tubercles on the hinder portions; the hinder margin is slightly truncated, the front odd bone is transverse, very much pitted, and united to the front costal by a linear suture without any pits; the front of the cartilaginous disk is covered with large warts, and there are several longitudinal series of acute warts on the middle part of the hinder flap; sternal callosities four, the lateral ones large, wider on the inner than on the outer side; the anal callosities triangular, front edge sinuous and rather wider than the length of the straight inner edge.

11. TYRSE.

Head elongate, face elongate, conical, narrow in front; forehead shelving. Skull, underside scarcely bent down in front. Palate nearly flat; central longitudinal concavity in front of the internal nostrils wide, much wider behind; internal nostrils small, rounded, with a short concavity behind each. The alveolar process of the upper jaw linear, elongate, scarcely wider behind. Lower jaw rather broad, with a shelving concavity on the upper surface in front, with a sharp alveolar edge which is rather wider and has a linear elongate concavity on the upper surface of the hinder half of the sides. Sternal callosities four, lateral and anal; anal triangular, rather broader than long. The hinder costal bones short, forming together a semicircle which is about two-fifths of the width of the costal pieces before them.

Tyrse, *Gray, P. Z. S.* 1864, p. 87, & 1869, p. 214.

Sternal callosities four. Nose elongate, conical, shelving. Forehead flat. Eyes submedian. Upper jaw with a broad concave alveolar plate of nearly equal width in all parts. The lower jaw with a sharp edge, with only very slight indications of a flattened alveolar edge on the hinder part of the inner side; the front of the jaw shelving forwards, and with a large concavity on the upper surface behind the edge. The palate flat behind, with a broad concavity in front of the internal nostrils, which is continued behind on both sides of them. The internal nostrils large, oblong, far back, nearly in a line with the front of the zygomatic arches, and with a large deep concavity, separated by a central longitudinal ridge, behind each of them. The nostrils large, rounded, with an internal lobe on the inner edge (see Wagler, N. Syst. Amph. t. 2. f. 19).

The skull of this genus is at once known from those of the genus *Trionyx*, by the nose being elongated, shelving, and not rounded, and by the form of the palate. The skull of a young specimen from the Nile is figured in the 'Cat. of Shield Reptiles,' t. 42. f. 2.

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The anterior odd bone of the dorsal disk in a very young specimen in the British Museum is smooth above and separate. In an adult specimen it is pitted above, united to the disk by a straight suture.

1. Tyrse nilotica. B.M.

Trionyx niloticus, *Gray, Syn. Rept.* 48; *Cat. Sh. Rept.* 68, t. 42. f. 2 (skull).
Tyrse nilotica, *Gray, Cat. Tort. B. M.* 48; *P. Z. S.* 1864, p. 88.
Testudo triunguis, *Forsk.*
Trionyx ægyptiacus, *Geoff. Egyp.*
Gymnopus ægyptiacus, *Dum. & Bibr.*
Trionyx labiatus, *Bell, Test.* t. 1 & 2 (skeleton).
Aspidonectes ægyptiacus, *Fitz.*
Aspidonectes aspilus, *Cope, Proc. Acad. Nat. Sci. Philad.* 1859, p. 295 (adult).

Hab. Africa, North and West; Fernando Vas river (*Cope*); Sierra Leone (*Bell*).

The young specimens have the head, limbs, and edge of the shield dusky, with round white spots.

The very large specimen of *Trionyx* from Western Africa, obtained from M. du Chaillu, agrees with Mr. Cope's description of *Aspidonectes aspilus*; I can see no difference between it and the half-grown specimens of *Trionyx niloticus* from Egypt in the British Museum. In the two Egyptian specimens the hinder callosities are separated from the lateral ones, and the hinder part of the inner edge of the lateral callosities is regularly rounded.

There is a large skull and other bones of a species of the genus in the Museum of the College of Surgeons, which was presented by Captain Sir Everard Home. The locality of this species is not stated; but it is probably from the Indian or Australian Seas. It is very like the skull of *Tyrse nilotica*; and if it came from Africa, it may probably belong to that species. It is described in detail by Professor Owen in the Catalogue of the Osteological Specimens in that Museum (see p. 181, nos. 922, 923).

A rather younger stuffed specimen in the British Museum has the anal callosities smaller and less developed; they are, as in the older specimen, rounded at the angles and broader than long.

Skeleton of a young specimen of *Tyrse nilotica*? in the British Museum, with the ends of the ribs still free, which was presented to the Zoological Gardens by Col. Chesney. Sternal callosities *four*; the lateral transverse ones dilated and rounded at the inner half of the hinder margin; the posterior callosities oblong-triangular or elongate-triangular, with angles broadly rounded; the anterior dorsal band rugose, three-fourths the length of the second, and the two closely united together by an even suture.

It is most probably *T. nilotica*, though the front of the upper jaw is rather more bent down than in the other specimens of that animal that I have seen; but they have all been older, and it may be a peculiarity of age.

A very fine skull of this species is in the Museum of the College of Surgeons, no. 922. It is $5\frac{1}{2}$ inches long, and $3\frac{3}{4}$ wide.

The skeleton of the animal from Sierra Leone, figured by Bell under the name of *Trionyx labiatus*, which appears to be the only part of the type specimen that is preserved, is now with the rest of his collection in the Museum of the Cambridge Philosophical Society, who purchased it. Professor Newton has kindly allowed me to examine it and to compare it with the skeleton of *Tyrse nilotica*; and I can see no difference between them. Mr. Bell seemed to regard the length of the free part of the ribs, which depends on the youth of the specimen, as a specific character.

See Trionyx Mortonii, *Hallowell, Proc. Acad. N. S. Philad.* ii. 120.

Hab. Africa.

12. CALLINIA.

Head small, elongate; face narrow, tapering; eyes lateral, superior. The jaws weak; the alveolar plates narrow at the hinder part, triangular and broader in front. The lower jaw slender, narrower at the hinder part of the sides. The central palatal groove in front of the internal nostrils rather wide and deep. The dorsal disk oblong, broad. The odd bone in front of the dorsal shield separate, transverse, and pitted in the young animal; in the older one it is united to the front costal bones by a straight edge with two round perforations, one on each side of the central part. The vertebral callosities narrow. The costal callosities scarcely broader at the outer edge, except the fifth and sixth pairs; the hinder pair short, and narrow at the outer ends. Sternal callosities four; the lateral pair broad on the inner side; the hinder or anal pair oblong-triangular, oblique, with a straight inner edge.

Aspidonectes, sp., *Agassiz*, not *Wagler*.
Callinia, *Gray, P. Z. S.* 1869, p. 221.

1. Callinia microcephala. B.M.

Olive-brown; the hinder part of the disk nearly smooth, without any rows of tubercles; the first vertebral bones transverse, short, rugose, with two circular pits behind,

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between it and the second vertebral plate (probably disappearing in the adult); sternal callosities four, evenly rugose; head small, slender, rather elongate; nose slender, conical, tapering.

Potamochelys? microcephala, *Gray, P. Z. S.* 1864, p. 87.
Callinia microcephala, *Gray, P. Z. S.* 1869, p. 220.

Hab. Sarawak (*Wallace*).

This species differs from all the other Mud-Tortoises from Asia in the small size and slender and tapering form of the head. It is evidently a young specimen, from the extent to which the ribs are still free, and the separate state of the bones of the head; but the dorsal bony disk and the sternal callosities are well developed. This species chiefly differs from *C. spinifera* in the dorsal disk being shorter and broader, subcircular instead of oblong longitudinal; the odd anterior vertebral bone small and shorter.

2. Callinia spinifera. B.M.

Head with two streaks on each side.

Trionyx Argus, *Gray, Cat. Sh. Rept.* 68.
Aspidonectes spinifer, *Agassiz, Contrib.* 403, t. vi. figs. 1 & 2.
Trionyx ferox (part.), *Gray, Cat. Sh. Rept.* 68.
Callinia spinifera, *Gray, P. Z. S.* 1869, p. 220.
Trionyx spiniferus, *Lesueur, Mém. Mus.* xv. 258, t. 15.
T. ferox, *Holbrook, Herp. N. A.* ii. t. 1.
Tyrse Argus, *Gray, Knowsley Menag.* t.

Hab. North America.

"Eyes large, very closely approximate; pupil black; iris pale lemon-colour, very brilliant, with an interrupted longitudinal black band."—*Holb.* ii. 13, t. 1.

In the 'Knowsley Menagerie' I described a species of *Trionyx* living in Knowsley Park, which was said to have been sent from Sierra Leone, under the name of *Tyrse Argus*, Gray, Cat. Tort. B. M. 48; Knowsley Menagerie, t. ; *Trionyx Argus*, Gray, Cat. Shield Rept. B. M. 68. When I compare this specimen with the specimen of *Trionyx spiniferus* which I have received from North America, I am very doubtful whether there must not have been some confusion about the habitat of the specimen, and whether it is not more probably a North-American species—especially as since our increased intercourse with West Africa we have not received any more specimens.

The specimen figured in the 'Knowsley Menagerie,' which is now in the British Museum, has the nose elongate-conical; and the forehead, as shown in the dry specimen, is elongated, lozenge-shaped, much longer than broad.

Var. 1. Aspidonectes asper, *Agassiz*, 405.
2. A. nuchalis, *Agassiz*, 406.
3. A. Georgii, *Agassiz*, 407, t. 6. f. 4, 5.

The cartilaginous disk with a series of spines in front, and with seven longitudinal series of acute spines on the middle of the hinder flap, and a longitudinal series of them on the front of the body-disk. The dorsal bony disk subcircular, truncated behind, the odd anterior bone transverse, tubercular, attached to the front costal by a straight suture without any pits. The vertebral bones elongate and narrow. Sternal callosities four, lateral subtrigonal, very much broader on the inner than on the outer side; the anal callosities triangular, wider than long, nearly united together by the straight internal edges, and by two angular prominences in front; jaws moderate; alveolar surface triangular in front, narrow on the sides, and tapering to a point behind.

There is in the British Museum a half-grown specimen in spirit:—The palate-groove in front of the inner nostrils wide and rather shallow; the alveolar surface of the upper jaw and of the sides of the lower jaw linear, moderately wide, not dilated behind; the lower jaw rather weak, with a flat or slightly concave alveolar space in front. There is a second, younger specimen, in spirit, in the same collection:—The head elongate, slender; the face elongate, tapering in front; eyes small; the alveolar surface of the upper jaw linear, of a moderate width, not broader behind than the front of the sides; the lower jaw slender, with the alveolar part of the front edge rather produced, subtrigonal, with a sharp front edge, linear on the sides, not dilated behind.

There are three specimens, in spirit, in the British Museum, of different ages, from the newly hatched to the middle-aged animal. The streaks on the sides of the face and the spots on the dorsal disk are well marked in them all.

B. *Sternum dilated behind, with a flap on each side covering the hind legs.*

Cyclanosteina, *Gray, P. Z. S.* 1864.

* *Sternal callosities four.*

13. TETRATHYRA.

Tetrathyra, *Gray, P. Z. S.* 1865, p. 323; *Ann. & Mag. N. H.* 1865, xvi. 205.

The face of the skull short, convex, arched in front;

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orbits lateral, shelving, about midway between the end of the nose and the front of the zygomatic arches; forehead flat, rhombic, broad. The dorsal shield with flexible margins, without any marginal bones; front of dorsal shield warty above and without any odd nuchal bone. Sternum flat, with broad rounded lobes covering the feet, and two pairs of sternal callosities; the front pair small, rounded, on the front ends of each of the front pairs of sternal bones; the lateral pairs are large, oblong, broadly notched out behind and very rugose. Lower jaw narrow, sharp-edged in front, dilated on the hinder part of the sides; the alveolar surface linear in front, broader and concave on the hinder part of the sides, as in *Cyclanosteus*.

This genus differs from *Cyclanosteus* in the want of any odd bone in front of the dorsal shield, as well as in the number and disposition of the sternal callosities.

The upper surface of the front of the disk is closely covered with roundish warts. The sternal callosities are not developed in the young specimen, the larger lateral pair being first indicated as the animal increases in size. The dorsal disk of the young specimen is marked with close grains, or warty, in rather arched longitudinal ridges.

There are some young specimens, in spirit, from West Africa in the Museum, which belong to this species; they differ from the young of *C. senegalensis* in being marbled, while that species is marked with distinct small subcircular black spots.

1. Tetrathyra Baikii. B.M.

Head olive, white-spotted; back olive, marbled with black above; the lower surface pale, irregularly black-marbled or spotted. The front pair of callosities small, oblong.

Younger specimen:—The head and dorsal shield pale brown, marbled with large black (often inosculating) streaks; lower part of head and sternum black, with large irregular-sized pale spots some of which are symmetrical.

Tetrathyra Baikii, *Gray, P. Z. S.* 1865, p. 324, fig.; *Ann. & Mag. N. H.* 1865, xvi. 205, fig.

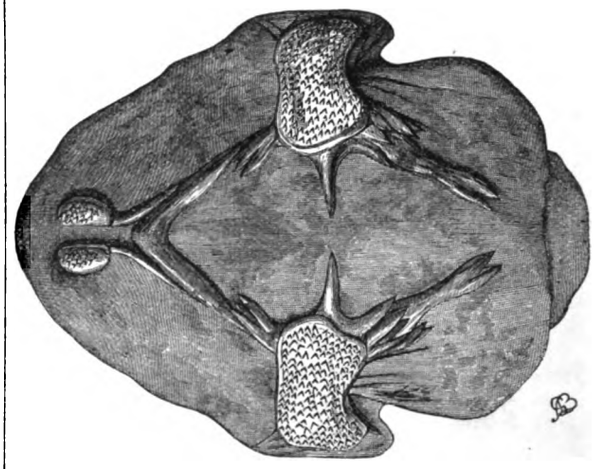
Hab. West Africa, River Niger?

The largest specimen, which is not full-grown, is 11 inches long; the dorsal shield 7 inches long and 5 inches wide.

The two specimens in the British Museum were received from Western Africa (collected by the late Dr. B. Baikie, probably on the Niger).

It differs from the other African *Trionyches* with covered feet in only having two pairs of callosities on the sternum; while *Heptathyra* has seven, and *Cyclanosteus* has nine such hardnesses on the sternal bones. These callosities differ in disposition and mode of development, as well as in manner, in the three genera. The form of the skull is like that of the genus *Cyclanosteus*; that is to say, the face is moderate, with eyes about halfway between the front of the zygomatic arch and cavity of the temporal muscle and the end of the nose; but it differs from the skull of the latter genus in the forehead and crown being wider and flatter.

Fig. 36.



Tetrathyra Baikii.

There are three young stuffed specimens of this Tortoise in the British Museum; they are of a uniform dark colour above, and horn-coloured below; one of them is varied with small black spots on the back; two of the largest have the four sternal callosities more or less developed. The hinder pair of sternal bones are linear, scarcely dilated at the ends, the ends directed backwards, and do not become united to each other; in the youngest specimen they are bifid, in the old one they are lanceolate.

The inner process of the lateral bones, that bears the lateral callosities, has a linear process on the inner side towards the middle of the sternum.

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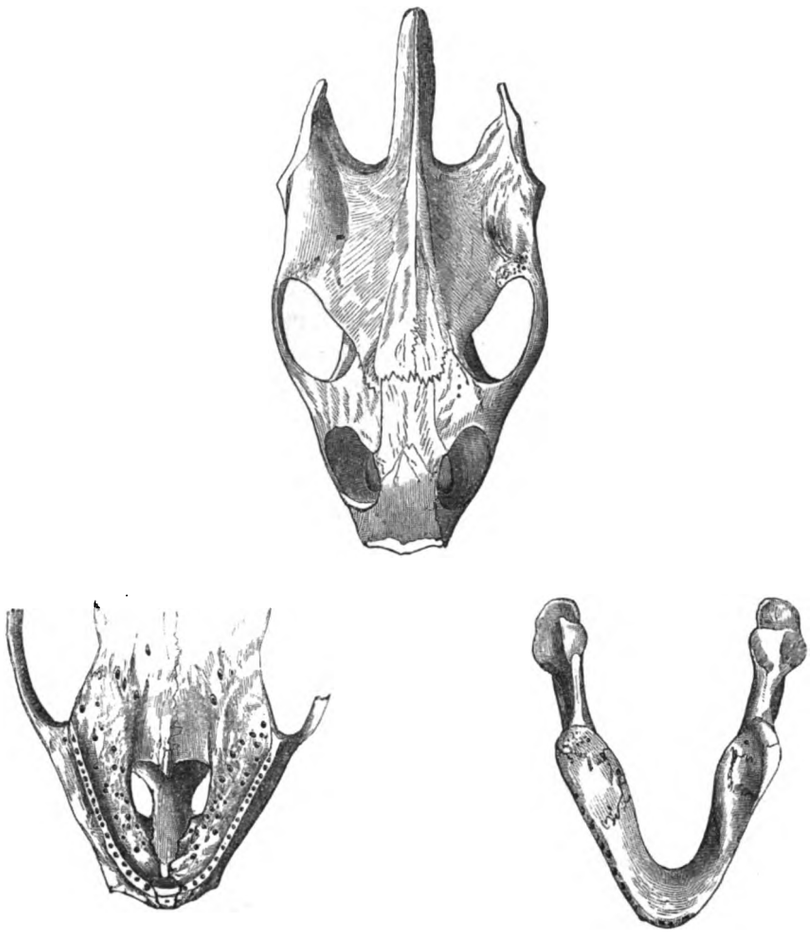
** *Sternal callosities nine.*

14. CYCLANOSTEUS.

The face of the skull short, convex, arched in front; orbits rather lateral, shelving; forehead flat, rhombic, elongate. Palate concave, flat behind; in front with a large, broad, deep concavity behind the very large oblong internal nostrils, and a small central, deep, triangular concavity in front of them. The alveolar plate very broad and flat, broader behind, and hooding over and continued far behind the internal nostrils. Lower jaw strong, flattened, very broad, simple, depressed, and sharp-edged in front, with the hinder half flattened out internally into an ovate, rather concave alveolar disk. Sternal callosities nine: two pairs and an odd central one in front; the two front pairs on the central line and the odd one behind them in the centre; lateral pair very large, long, and broad, rounded in front and on the inner side, separate, and not united in the middle line; the anal pair oblong, longitudinal, far apart.

Fig. 37.



Cyclanosteus senegalensis.

Cyclanosteus (restricted), *Gray*, *P. Z. S.* 1855, p. 201, 1860, p. 315, & 1864, p. 94.
Cyclanorbis, *Peters*, *MS.* 1848.
Gray, *P. Z. S.* 1852, p. 133.

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1. Cyclanosteus senegalensis. B.M.

Emyda senegalensis, *Gray, Cat. Tort. B. M.* 47; *Cat. Sh. Rept.* 64; *P. Z. S.* 1860, p. 316 (junior).
Cyclanosteus Petersii, *Gray, Cat. Shield Rep.* 64, t. 29; *P. Z. S.* 1860, p. 315.
C. senegalensis, *Gray, P. Z. S.* 1864, p. 95, figs. 16–18 (skull), and 1865, p. 427.
C. (Cyclanorbis) Petersii, *Gray, P. Z. S.* 1852, p. 135; *Ann. & Mag. N. H.* 1855, xv. 69.
Cryptopus senegalensis, *Dum. & Bibr. Erp. Gén.* 505.

Hab. West Africa; Gambia.

An adult living specimen, in the gardens of the Zoological Society, has much the appearance of a large depressed *Emys*, the back being smooth and polished, entirely hiding the rugosities of the bony disk, blackish olive, with concentric lines or wrinkles in the broad space between the marginal odd bone and the front part of the dorsal disk. The lateral and hinder margins of the disk thick, smooth, expanded behind, and rather bent up on the hinder edges over the feet. The underside of the margin and sternum white. The head rather large, olive, with whitish spots; nose rather produced; nostrils flesh-coloured, small, circular, separated by a broad septum, with a small lobe on the outer side; pupil small, black; iris greyish, without any spot on the sides; lower eyelid large, thin, pellucid, whitish; the hinder part of the fore feet very broad, lobulated on the edge, folded together when contracted, with the three claws on the front part of the foot.

The young specimens in the British Museum from the river Gambia have the head pale grey, with some pale roundish spots (and without any indication of black streaks).

The specimen of *Emyda senegalensis* which we have received from Paris as coming from Senegal, is evidently the young of a *Cyclanosteus*, and not of an *Emyda*; and as it agrees in many particulars with the young specimen which we have received fron the Gambia as *Cyclanosteus Petersii*, it is most probably the young of that species. It differs from the specimen which we have from the Gambia, of the same size, in having a few scattered black specks on the hinder part of the dorsal shield; but this probably arises from the Senegal specimen having been better preserved by being placed and kept in stronger spirit.

There are three young specimens, in spirit, which have the jaws of *Cyclanosteus*, in the British Museum; and I believe them to be the young of *Cyclanosteus senegalensis*. They were received from Dr. B. Baikie.

"The British Museum has recently purchased, at a sale of the natural-history specimens collected by the late Dr. William Balfour Baikie, R.N., during his recent explorations up the Niger, a series of five specimens of the Tortoise which I figured in the 'Catalogue of Shield Reptiles in the British Museum,' under the name of *Cyclanosteus Petersii* (t. 29), but which, I have been induced since to believe, may be the more adult state of *Cryptopus senegalensis* (Dum. et Bibr. Erp. Gén. ii. 504), and have hence, in my 'Revision of the Species of *Trionychidæ* found in Asia and Africa' (P. Z. S. 1864, p. 76), named *Cyclanosteus senegalensis*."

The specimen which is figured in the 'Catalogue of Shield Reptiles in the British Museum' represents all the callosities in the sternum as developed when the animal is approaching maturity, with the two hinder ones of a small size.

"The series which we have now received shows that the animal sometimes reaches nearly the adult size without any indications of the hinder callosities being developed; in another specimen of nearly the same size, the place they occupy is only marked by a small smooth tubercle, showing through the skin. In the specimen figured in the catalogue above referred to, the callosities are of a small size and rounded form. In one of the specimens now received they are of a larger size and more oblong form; in a second, rather larger specimen they are much larger, oblong-elongate, occupying nearly the whole length of the bones on which they are placed; and in a third specimen, which has all the sternal callosities very much developed, and some additional ones on the sides of the front ones, the hinder pair of callosities are of a very large size, covering the greater part of the hinder portion of the sternum between the hinder moveable lobes; the callosities are of an elongated subtrigonal shape, with nearly straight sides and a rounded hinder end; they have a double notch on the front edge, fitting into two similar notches in the outer hinder edge of the abdominal callosities.

"The five gular callosities are very similar in disposition; but they vary greatly in form and size, compared with each other, in the different specimens of this series.

"In one which is destitute of the hinder callosities, the second pair of gular callosities are long and narrow, forming with the hinder gular callosity a nearly circular disk; while in all the other specimens the second pair of callosities are broad and separated from the edge of the third callosity by the rounded form of the outer hinder angle; the single hinder callosity is generally wider than the others; the first pair in two specimens are square, nearly as broad as long; but in the four other specimens they are much broader than long, from front to back,

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forming together a broad band with an arched outline in front of the second pair (see fig. 38).

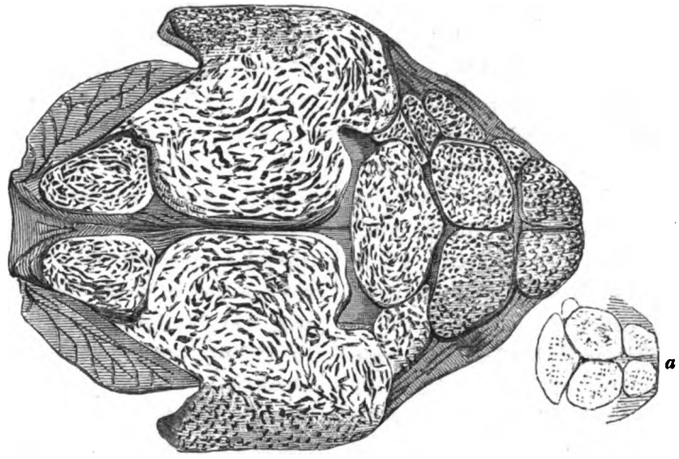
"In all the other specimens there is no indication of such additional plates, except in the one which has all the callosities so much developed. This specimen has several distinct, well-marked callosities, besides the usual number: thus, there is a small triangular one at the outer hinder edge of the right plate of the first pair; there is a roundish smooth bony plate on the middle of the outer side of the left, a rugose callosity of a triangular shape on the outer side of the right callosity of the second pair; the space between the outer hinder angle of the second pair of gular callosities, the side of the odd third plate, and the front edge of the middle of the abdominal callosity is filled up with an additional callosity; on the left side this callosity is single and of a square form; on the right side it is divided into two parts, the anterior part being triangular, and the hinder rather irregular in its outline.

"The middle lateral abdominal callosity of this specimen is large; but these callosities differ greatly in size and form in the different specimens. This specimen seems to show the callosities in the maximum state of development; and if I had not possessed a series of specimens (apparently coming from the same locality) showing how mutable the form and size of the callosities are in this species, I should have been induced to believe it exhibited the characters of a distinct and well-marked species.

"In the specimen without any hinder callosities there is a single, small, roundish, additional tubercle on the right side of the hinder outer angle of the second pair of gular plates; but there is none to match it on the other side of the sternum.

"As in all other *Trionychidæ*, the young specimen of this

Fig. 38.



Cyclanosteus senegalensis, var. *callosa* = *Baikiea elegans*?
Fig. *a*. *C. senegalensis*, var. *equilifera*.

species is destitute of any callosities: but, from the foregoing observations, the gular and abdominal callosities appear to be developed nearly at the same time; and the hinder pair do not make their appearance till later in the life of the animal, and seem to be gradually developed, being at first small and roundish, until they cover the whole length of the bone on which they are placed; hence they vary considerably in shape and size in the different individuals of the species.

"The Tortoises under examination may be referred to three principal varieties:—

"a. *equilifera*.—The sternal callosities moderately far apart; front gular square; second pair and hinder ones forming a circular disk; abdominal moderate; posterior absent. (Fig. 38 *a*.)

"b. *normalis*.—The sternal callosities moderate, far apart; the gular broad, transverse; the abdominal well developed; the posterior pair, at first small, at length becoming oblong-elongated, covering the bone.

"c. *callosa*.—The sternal callosities very large, and almost entirely covering the sternum, with some additional, irregular, non-symmetrical callosities on the sides of the gular ones; the posterior callosities very large, elongate-trigonal." (Fig. 38.)

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I think it very probable that the variety which I have called *callosa* is most likely the thorax of *Baikiea elegans*.

†† *The front and lateral edges of the lower jaw broad and expanded.*

15. BAIKIEA.

The jaws with a very broad alveolar surface, which is as broad and concave in front as behind. Sternal callosities ——?

In the monograph of the African and Indian Trionyches in the 'Proceedings of the Zoological Society' for 1864, I observed that in the British Museum there is a skull which was received from the River Gambia without the animal, and which appears to be that of the adult *Cyclanosteus senegalensis*. The whole upper edge of the lower jaw is very much dilated and moderately concave; while in the skull of a half-grown specimen, apparently of the same species, the front half of the lower jaw is high, narrow, with a simple sharp edge, and the hinder portion of the upper edge is more and more dilated and flattened as it approaches the condyle, so as to form an oblong, concave, flattened disk on the surface. Unfortunately I have not the skull of a young specimen to compare with the other two; but I should not be surprised to find that the whole upper edge in the young specimen is simple and shelving, like the adult state of *Tyrse nilotica*.

I have not seen any observations in Professor Agassiz's work which show that he has observed such a change of form of the lower jaw in any of the North-American species of this family. In his account of the general characters of the family he simply observes, "the lower jaw grows more flattened towards the front end" (Contrib. i. 332).

In the description of the genus *Tetrathyra* in the 'Proceedings of the Zoological Society' for 1865, I observed that this second genus of *Cyclanosteina* may explain the reason why we have two skulls from West Africa, the one with the hinder half, and the other with the whole upper edge of the lower jaw dilated, as figured in the 'Proceedings of the Zoological Society' for 1864, fig. 18, p. 95, and fig. 21, p. 96.

However, having succeeded in opening the mouths of the specimens upon which the genus *Tetrathrya* was established, without injury to the specimens, I have to state that that genus does not explain the difficulty; for the form of the lower jaw and the alveolar surface of *Tetrathyra* is exactly like that of the genus *Cyclanosteus* as figured in the 'Proceedings of the Zoological Society,' 1865, figs. 16, 17, 18. But the doubt which I have expressed above has been most satisfactorily explained from an examination of a very young specimen of a *Trionyx*, that was also received from Dr. Baikie, and which I had regarded as a beautifully coloured variety of *Cyclanosteus Baikiei*.

In the "Revision of the Species of *Trionychidæ*," in the P. Z. S. 1864, p. 95, I figured the skull of an African Trionychid with a very broadly dilated concave alveolar surface to the jaws, which I considered might perhaps be the adult state of the jaws of *Cyclanosteus senegalensis*. In my paper on the genus *Tetrathyra*, in the Proc. Zool. Soc. for 1865, I thought that it might perhaps be the skull of the Trionychid which I then described under the name of *Tetrathyra*. Since that time I have been able to examine the skull of a young Trionychid from Africa, which has the broadly expanded alveolar surface of the adult skull that I figured. This shows that the form of the alveolar surface does not depend on the age of the specimen, and that it is the character of an additional genus, which I have named after Dr. Balfour Baikie, from whom we have received so many species from Central and Western Africa.

Unfortunately there are only skulls of adult and a specimen in spirit of a young animal of this species; so that we do not know the form and number of the sternal callosities, especially those of the adult form. I suspect that the thorax in the British Museum, received with the jaws, may be that of an adult animal; but there is no material to show that this is the case. If it is, the sternal callosities are as in *Cyclanosteus* with some smaller additional ones in front, as in the specimen figured as *Cyclanosteus senegalensis*, var. *callosa*, Gray, P. Z. S. 1865, p. 424, f. 1.

The specimens of African Trionyches with covered feet have been very difficult to determine. The materials have arrived so slowly that, with the best desire to arrive at the truth, one has had to change one's opinion repeatedly as new specimens unfolded new points in their structure.

I am now satisfied that there are three very distinct genera; but one genus is only known from very young specimens and the skulls of very large and adult ones; but the examination of the skulls or alveolar plates of specimens in the young, half-grown, and adult state shows that the alveolar plates and the skulls of the younger specimens are very similar to those of the adult.

I was inclined to regard the very large skull with a

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very broad flattened alveolar plate in the upper and in the lower jaw as belonging to the very adult state of the common Senegal species, which has the lower jaws narrow and sharp-edged in front; but I have lately received a very young, almost just-hatched, specimen, which has, compared with its size, as broad and flattened an alveolar plate in the lower jaw as is found in the most adult skulls.

At first I thought that the young specimen in spirit that I received from Dr. B. Baikie was a younger state, as the stuffed specimen that I also received from Dr. B. Baikie and described in the 'Proceedings of the Zoological Society' as *Tetrathyra Baikii*; and I believed that I had solved the difficulty that existed in having the skulls of two very different forms from the same country, one with thick and the other with thin alveolar edge in the front of the lower jaw; but I thought I had better be quite certain and examine the jaws of the type specimen of *Tetrathyra Baikii*, which I at length, after great patience and with much care, was able to do without injuring the specimen. And it was well that I was so careful; for the lower jaw of the typical *Tetrathyra* was thin and sharp-edged in front, like the lower jaw of *Cyclanosteus*, proving that the young specimen in spirit that I had examined, and the four or five very large skulls which were in the British Museum from West Africa, belong to different species and form a third genus of these animals, which is only known by the just-hatched specimen in spirit and the large skull in the collection, so that we cannot describe the number or the position of the sternal callosities, which are so different in the genera *Cyclanosteus* and *Tetrathyra*, one having several and the other only four of these easily seen characters of these animals.

We have received several large skulls, similar to the skull figured in the Proc. Zool. Soc. 1864, p. 22. f. 19, all having the broad alveolar surfaces the whole extent of the labial edge of the lower jaw. And we have also received several young specimens, in spirit, which I believe to be the young of *Tetrathyra Baikii*; and, having examined the mouth of one of these specimens, it is clear that the genus *Tetrathyra* is distinguished from *Cyclanosteus* in having a very broad alveolar surface the whole length of the upper jaw, and that this character is found fully developed in the very young specimen, without any indication of the sternal callosities as in the larger, full-grown one—as the size of the adult heads shows that *Tetrathyra* in its adult age is a larger animal than *Cyclanosteus*.

We know that the skull with the thin sharp edge to the front of the lower jaws and the broader hinder edge belongs to the genus *Cyclanosteus*; and we have a skeleton of that genus with the nine sternal callosities which are characteristic of the genus in the Museum collection; so that the two forms of the alveolar edge, which I thought might be produced by age, are the characters of two genera.

There was received from Dr. Baikie a specimen of the thorax of a *Trionyx* with hidden legs, which agrees with the specimen of *Cyclanosteus* in having nine principal callosities, which are placed in the same position as in the specimen of that genus that came with them; but the nine callosities are of very different form and size, and they are accompanied by a number of additional small callosities which almost cover from view the cartilaginous part of the sternum in that genus.

It is a question if this thorax belongs to a second species of *Cyclanosteus* or only to a variety of *C. senegalensis* with an abnormal development of the callosities, or if it is the thorax of an adult specimen of the genus *Baikiea*. All this would have been settled if the thorax had been accompanied by the other parts of the body, or even by the skull. If it is a normal form, which I believe it to be, it cannot belong to *Cyclanosteus senegalensis* or *Tetrathyra Baikii* or *Heptathyra Livingstonii*, as we have the sterni of these genera with the callosities; so that it can only belong to the genus *Baikiea*, which we only know from a very young specimen (in which the sternal callosities are not developed) and the skull of an adult.

If this is the proper explanation of the thorax, it will be very curious that the two genera *Cyclanosteus* and *Tetrathyra*, which have the lower jaw and alveolar surface of the same form, should have very different sternal callosities, and that the *Baikiea* (which has the lower jaw and the alveolar surface of a peculiar form) should have the same sternal callosities, with a few additional ones, as *Cyclanosteus*.

The sternum is known from the sternum of the normal *Cyclanosteus senegalensis* by the large size and different form of the lateral additional, and of the subcaudal or hinder callosities, as well as by the development of the lateral additional callosities on the outer edge of the front ones.

1. Baikiea elegans. B.M.

The young specimen in spirit has the back of the thorax dark olive-brown with large yellow spots, which are somewhat similar but not quite symmetrical on the two sides of the central keel; and there is a series of large but smaller square or roundish yellow spots on the margin. The sternum and under surface of the margin blackish,

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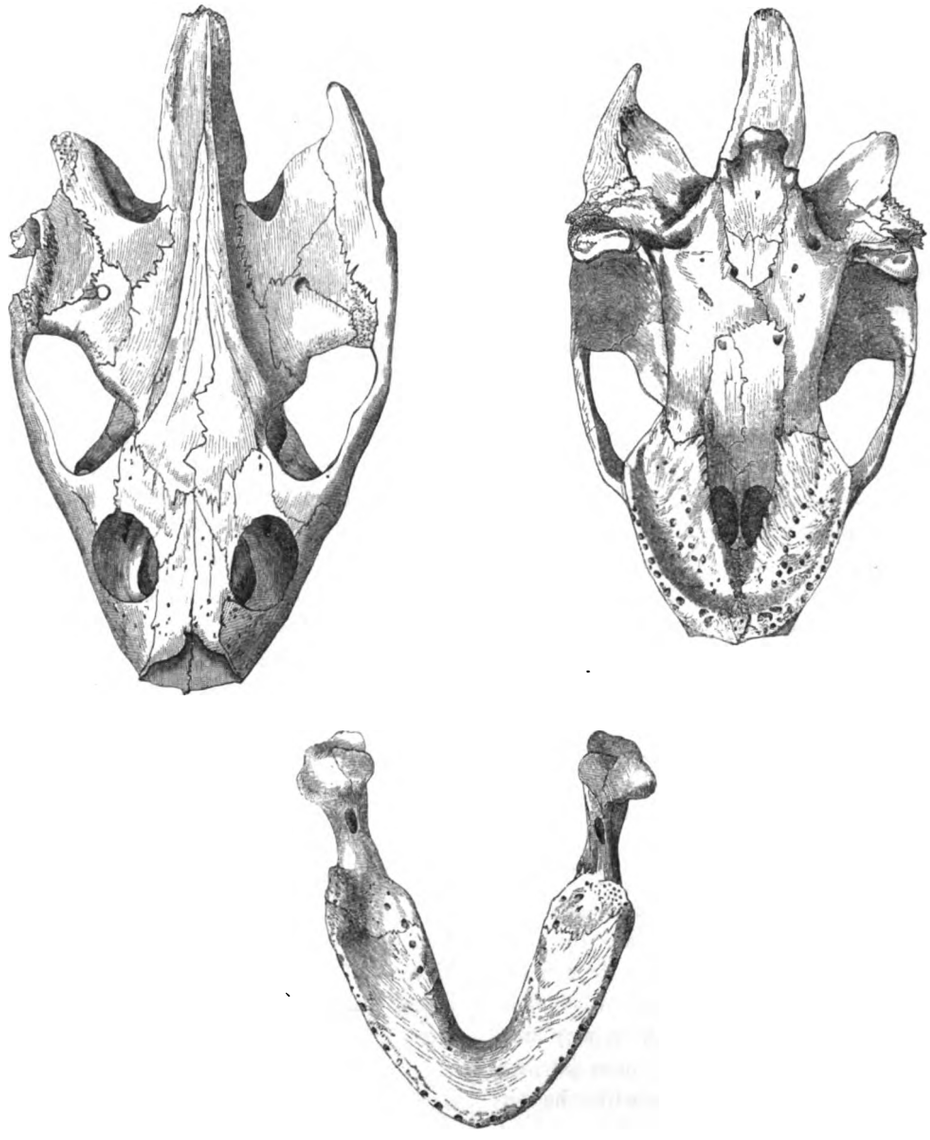
with yellow spots, and a narrow yellow edge to the lobes of the sternum. The underside of the shield is varied with yellow on the edges. Head grey-brown, white-spotted. Thorax white.

Cyclanosteus senegalensis (adult), *Gray*, *P. Z. S.* 1864, p. 22, fig. 19–21 (skull).
C. senegalensis, var. *c.* callosa, *Gray*, *P. Z. S.* 1865, p. 425, fig. 1.
Baikiea elegans, *Gray*, *P. Z. S.* 1869, p. 222.

Fig. 39.



Baikiea elegans.

The young specimens of *Cyclanosteus senegalensis* in spirit are known from those of *Baikiea elegans* by having the white spots on the crown and sides of the head nearly of the same size; in *B. elegans* the spots on the crown are small and those on the sides of the head are larger and unequal-sized.

A young animal in the British Museum, in spirit, collected by Dr. B. Baikie in Western Africa. The

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back of the thorax is dark olive-brown, with large yellow spots, which are somewhat similar but not quite symmetrical on the two sides of the central keel; and there is a series of smaller square or roundish yellow spots on the margin; the sternum and under surface of the margin blackish, with yellow spots and narrow yellow edge to the lobes of the sternum. The under margin of the shield is varied with yellow on the edge. Head grey-brown, white-spotted; throat white.

A young stuffed specimen in the British Museum, in which the sternal callosities are not developed, is very dark above, not showing any distinct coloration of any kind; but the underside is black, with large irregular unequal yellow spots, like the back of a young specimen in the same collection; the chin and throat are yellow-varied; indeed the spots are so close that it may be said to be yellow, with irregular black reticulations. The dorsal disk has a broad tubercular space in front of the bones, and the whole back is covered with lines of tubercles. The alveolar surface of the jaws is broad and rounded.

Fam. III. EMYDINADÆ.

Dorsal disk strengthened with a series of internal marginal bones. Skull oblong, swollen, convex; the palate with a central groove.

Emydina, *Gray*, *P. Z. S.* 1861.

1. EMYDA.

The face short, convex; forehead and crown flattened above.

Emyda, *Gray*, *Syn.* 1861; *P. Z. S.* 1855, p. 201, & 1861, p. 220; *Cat. Shield Rept.* 63.
Trionyx, *Wagler*, 1830.
Cryptopus, *Dum. et Bib.* 1835.

The skull, as figured by Wagler (N. Syst. Amphib. t. 2. f. 24–31), has a high arched nose, rather flattened over the eyes, and a flat forehead. The palate with a narrow groove, rather narrowed in front of the oblong internal nostrils, placed in front of the middle of the alveolar margin. The alveolar margin of the upper jaw is flat, rather dilated behind. The lower jaw is strong, angular on the sides, with a narrow and flat alveolar edge.

"*Emyda punctata*. Pupil circular; iris without any lateral spot."—*Reeves*.

1. Emyda punctata.

Emyda punctata, *Gray*, *Syn. Rept.* 50; *P. Z. S.* 1855, p. 201, & 1864.
Trionyx coromandelicus, *Geoff.*
Wagler, *N. Syst. Amph.* t. 2. f. 21–23 (anat.).
Emyda granosa, *Theobald*, *Journ. Linn. Soc.* 1868, x. 18.

Hab. Pegu, Tenasserim, breeding in ditches (*Theob.*).

Two imperfect skeletons with skulls in the British Museum received from Dr. Falconer:—Skull depressed, elongate; crown flat; orbit large, subcircular, anterior; internal nostrils subanterior, with a very deep narrow central groove between; alveolar plates with an elongated groove behind each to the middle of the palate; palate flat behind. Alveolar plates of upper and lower jaws broad, broader below; the lower jaw with a well-developed alveolar surface, sharp-edged externally in front, and flattened or slightly concave behind.

Skull very like that of *Potamochelys*; but the front of the lower jaw has a rather broader alveolar surface in front, and the orbits are rather more anterior. (See Wagler, N. S. Amph. t. 2. f. 24–31).

A young specimen in spirit from Mr. Theobald:—The head is uniform greyish olive above and pale yellowish beneath; the eyebrows and sides of the head paler, with a rather darker streak from the hinder part of the eye, over the lips, to the back of the neck; back olive, with irregular darker spots.

We have a perfect specimen in the Museum of this animal, presented by Dr. Leith, from the tanks in the neighbourhood of Bombay. It is common in tanks.

We have lately received specimens from Allahabad and Sikkim, collected by the brothers Schlagintweit.

2. Emyda ceylonensis. B.M.

Emyda ceylonensis, *Gray*, *P. Z. S.* 1855, p. 201, 1864; *Cat. Sh. Rept.* 64, t. 29 *a*.
E. punctata, *Kelaart*, *Bell's Testud.* t. 1, 2.
E. vittata, *Peters*, *Monatsb.* 1854, p. 216.

Hab. Ceylon; Goa.

Emyda vittata (Peters, Monatsb. 1854, p. 216), from Goa, appears to be the same as *E. ceylonensis*, Gray (Proc. Zool. Soc. 1855, p. 201; Cat. Shield Rept. 64, t. 29 *a*, 1855). This animal is also figured by Mr. Bell as the true *Emyda punctata*, in his 'Testudinata,' t. 1, 2.

3. Emyda scutata.

Emyda scutata, *Peters*, *Berlin. Monatsberichte*, 1868, p. 440.

Hab. Pegu.

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Suborder V. Oiacopodes, or Sea-Turtles.

Toes enclosed in a compressed fin; claws rudimentary. The thorax covered with horny shields or a coriaceous skin.

Cheloniadæ (Turtles), *Gray, Cat. Sh. Rept.* p. 70.
Sea-Turtles (Chelonia), *Gray, P. Z. S.* 1869, p. 223.

Synopsis of the Families.

1. **CHELONIADÆ.** The thorax covered with distinct horny plates. The nostrils anterior; on the upper edge of the nose. Eyes moderate. Intermaxillary bone moderate, forming the front of the mouth.

2. **SPHARGIDIDÆ.** The thorax and sternum covered with a continuous coriaceous skin. Nostrils superior. The intermaxillary bone very large, high and erect, forming the front of the head. Orbits very large.

Fam. I. CHELONIADÆ.

Chelonina, *Gray, Cat. Sh. Rept.* 72.
Cheloniadæ, *Gray, Ann. Phil.* 1825, x. p. 212.

The thorax covered with distinct horny plates; the sterno-costal suture covered with a longitudinal series of sterno-marginal plates. Nose anterior, erect; the nostrils anterior, at the upper edge of the nose. Upper jaw simple, or rather hooked in front. Eyes moderate.

Skull oblong, crown flat behind; orbits moderate, nose truncate, erect; nostrils anterior, on the upper part of the nose. The intermaxillary bone small, narrow, short, erect.

The study of the skulls of these animals first led me to observe the importance of the alveolar chewing-surface of the jaws for distinguishing the genera.

Synopsis of the Genera.

I. *Alveolar surfaces of the upper and lower jaws simply concave. Shields of the thorax thin, rather membranaceous and brittle; the young three-keeled. Vertebral and costal shields* 15.—Carnivorous.

1. Caouana.

II. *The alveolar surface of the upper jaw concave, broad, narrower behind, with a single linear central ridge; lower concave, with a rather strong ridge on the inner side. Shields thick, horny, brittle, and imbricate; the young three-keeled. Vertebral and costal shields* 13.—Carnivorous.

2. Caretta.

III. *The alveolar surface of the upper jaw with two arched ridges, the inner one near the inner margin, the outer near the outer margin, and interrupted by a deep pit in front; lower one strongly toothed on the edge, with a subcentral ridge, with a large conical prominence in the middle, and a deep pit on each side in front of it. Shields horny, thick, not imbricate; the young not three-keeled. Vertebral and costal shields* 13.—Algivorous.

3. **Chelonia.** The vertebral bone behind the last rib transverse, broad in front, divided by two transverse sutures.

4. **Mydas.** The vertebral bone behind the last rib narrow, linear, or vase-shaped, attenuated behind.

I. *Alveolar surfaces of the upper and lower jaws simply concave. Shields of the thorax thin, rather membranaceous and brittle; the young three-keeled. Vertebral and costal shields* 15.—Carnivorous.

1. CAOUANA.

Caouana, *Gray, Cat. Sh. Rept.* p. 72.

1. Caouana caretta. (Loggerhead.) B.M.

Caouana caretta, *Gray, Cat. Sh. Rept.* p. 72.
Chelonia caouana, *Wagler, N. Syst. Amphib.* t. 1. f. v., viii. *Owen, Cat. Osteol. Mus. Coll. Surg.* 180 (skulls, n. 912–915).
Thalassochelys caouana, *Agassiz, Contrib.* 384, t. 6. f. 13 & 32.
Chelonia cephalo, *Schlegel, Fauna Japon. Chelon.* t. 5. f. 1, 2, 3 (head), and t. 6, fig. 3 (skull).

2. Caouana elongata. B.M.

Caouana elongata, *Gray, Cat. Sh. Rept.* 73.

3. Caouana olivacea. B.M.

Caouana olivacea, *Gray, Cat. Sh. Rept.* 73.

Hab. Indian Ocean.

II. *The alveolar surface of the upper jaw concave, broad, narrower behind, with a single linear central ridge; lower concave, with a rather strong ridge on the inner side. Shields thick, horny, brittle, and imbricate; the young three-keeled. Vertebral and costal shields* 13.—Carnivorous.

2. CARETTA.

Caretta, *Gray, Cat. Sh. Rept.* p. 73; *P. Z. S.* 1869, p. 223. *Agassiz, Contrib.* 380.
Eremochelys, *Agassiz, Contrib.* 380.

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1. Caretta imbricata. B.M.

Caretta imbricata, *Gray, Cat. Sh. Rept.* 74.
Eremochelys squamata, *Agassiz, Contrib.* 382.
Caretta squamata, *Swinhoe, Ann. & Mag. N.H.* 1863, p. 221.
Owen, Cat. Osteol. Mus. Coll. Surg. 180, (*not* Caretta, *Cuvier*).
Chelonia imbricata, *Schlegel, Fauna Japon.* t. 5. f. 1 & 2 (head), t. 6. f. 4 (skull).

III. *The alveolar surface of the upper jaw with two arched ridges, the inner one near the inner margin, the outer near the outer margin, and interrupted by a deep pit in front; lower one strongly toothed on the edge, with a subcentral ridge, with a large conical prominence in the middle, and a deep pit on each side in front of it. Shields horny, thick, not imbricate; the young not three-keeled. Vertebral and costal shields* 13.—Algivorous.

3. CHELONIA.

Chelonia, *Gray, Cat. Sh. Rept.* p. 74.
Agassiz, Contrib. 375.

1. Chelonia virgata. B.M.

Chelonia virgata, *Gray, Cat. Sh. Rept.* 74.
Agassiz, Contrib. 379.
Swinhoe, Ann. & Mag. N. H. 1863, p. 221.
C. mydas, *Owen, Cat. Osteol. Mus. Coll. Surg.* 158 (skeleton, n. 769; skulls, n. 774–777, 895–900).

4. MYDAS.

Chelonia ††, *Gray, Cat. Sh. Rept.* 75.
Agassiz, Contrib. 377.

1. Mydas viridis. B.M.

Chelonia viridis, *Gray, Cat. Sh. Rept.* 75.
Schlegel, Fauna Japon. Chelon. t. 6. f. 4, 5, 6 (head), t. 6. f. 1 & 2 (skull).
See Chelonia japonica, *Thunburg, Schweigger's Prodrom.* 21, and *Supp.* 1.
Chelonia Agassizii, *Bocourt, Ann. Sci. Nat.* 1868, x. p. 123.

Fam. II. SPHARGIDIDÆ.

The thorax covered with a continuous soft skin. Nose blunt and broad; nostrils on the upper surface of the nose. Upper jaw with a deep notch on each side. Eyes very large.

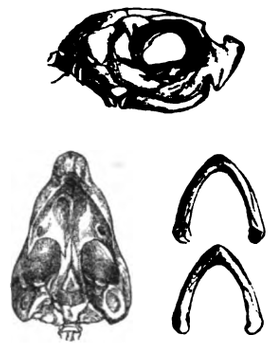
Skull oblong; crown swollen, subglobose behind. Orbits very large. Nose-cavity superior, carried up by the elongated erect intermaxillary bone. Maxillary bone with a deep notch in the front of the lower edge, near the intermaxillary. Lower jaw produced, acute, bent up in front.

Sphargididæ, *Gray, Ann. Phil.* 1825, x. p. 212.
Dermatochelydæ, *Fitzinger.*
Wagler, Amph. 20, t. 1. f. 1.
Sphargidæ, *Agassiz, Contrib.*

1. SPHARGIS. (The Luth.)

Sphargis, *Merrem.*
Gray, Cat. Sh. Rept. 71.
Coriudo, *Fleming.*
Sytina, *Wagler.*
Dermatochelys, *Fitzinger, Günther.*

Fig. 40.



Skull of very young *Sphargis coriacea.*

Mr. E. Gerrard has prepared a beautiful skeleton of a very young specimen of this genus, about 4 inches long. It is a most curious preparation, with its odd-shaped head with very large nasal cavities and orbits, extremely large fore fins with extremely slender fingers, and a short hind foot like the skeleton of a human hand—with the short metatarsi, and thumb springing from one side of the base of them as if it might be opposable.

The fingers and toes five; the fingers long, slender, the second, third, and fourth very long, of four joints, lower large, the last joint small and short; the first and third toes of three joints, the first strongest, the fifth shortest. The hind feet much like the human hand. The toes short; the thumb short, strong, from the base of the metatarsus, the other four toes longer, subequal, the third or middle toe being rather shorter, the second and fourth subequal, and the fifth rather the shortest and most slender. Sternal bone very narrow, only forming a large, oblong, elongated ring.

The common Turtle, covered with horny plates, has a skull as different from that of the coriaceous Turtle, which has the bones of the body covered with a soft skin, as the

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two animals are different in external appearance. I formerly regarded the coriaceous and the scale-bearing Turtles as forming two distinct families (Annals of Philosophy, 1825, vol. x. p. 212); but having received from Mr. Collie, as stated in the 'Catalogue of Shield Reptiles,' p. 75, a skull of a true Chelonian as that of a coriaceous Turtle (*Sphargis*), and finding they were so much alike, I was induced to reconsider the question and to unite *Sphargis* and *Chelonia* in the same family, regarding them as distinct tribes characterized by the nature of the surface. I had overlooked the figure of the skull of a nearly adult specimen from Japan, figured by Schlegel, Fauna Japon. Chelon. t. 2. f. 1 & 2. He also figures the head viewed in front (t. 5. f. 3), the head of a smaller specimen (t. 2. f. 3), the vertebræ (t. 2. f. 4 & 5), the front and hinder limbs (t. 3. f. 1 & 2), and the skull of a very young specimen that is given in Prof. John Wagler's 'New System of Amphibia' (t. 5. f. 1). In that work the skulls of the young *Chelonia* and young *Sphargis* are figured side by side; therefore the distinction can be easily seen. The great peculiarity of the skull of the genus *Sphargis* consists of the opening to the nose being in the upper part of the head, the nose-cavity being carried up by the elongated erect form of the intermaxillary bone; the orbits are also exceedingly large; and there seems little difference between the adult and the young animal.

There is no skull of this animal in the 'Catalogue of the Osteological Specimens in the Museum of the Royal College of Surgeons.'

Professor Agassiz complains that he has only been able to see adult specimens of the animal, and therefore cannot determine if any change is undergone during growth; and he described with some detail the form and structure of the head; but he does not say if it is from the examination of a skull, or only a description of the figure of the skull given by Schlegel. He states that "the intermaxillaries rise considerably above the level of the lower edge of the eye-orbit, and they are very thick above, and taper to a sharp edge below."

1. Sphargis coriacea. B.M.

Sphargis coriacea, *Gray, Cat. Sh. Rept.* 71.
S. mercurialis, *Schlegel, Fauna Japon. Chelon.* t. 1. f. 1, 2, 3, and t. 5. f. 3 (head and skull, &c.).
Dermatochelys porcata, *Wagler, N. Syst. Amph.* t. 1. f. 5, 6, 10–13 (skull of very young).

Hab. Atlantic, Mediterranean, Indian, Australian, and Pacific Oceans; Japan (*Siebold*). Australia, found at sea off Wollongong, N.S.W., 9 feet long, in Museum at Sydney.

Dr. Bleeker, in the 'Nat. Tijdschr. Nederl. Ind.' 1857, p. 471, mentions *Sphargis coriacea*, Merrem, as found at Pidang, in Sumatra (Gray, P. Z. S. 1864).

"*Dermatochelys coriacea* occurs on the coast of Pegu. When alive it was covered over with numerous white spots, like splashes of whitewash, which have since disappeared." —*Theobald, Journ. Linn. Soc.* x. 10.

Dr. Günther says this Turtle is herbivorous.

Agassiz (Contrib. vol. i. p. 373) doubts these all being the same species; but it seems, like the Sperm-whale, to be an inhabitant of the tropical regions, and a wanderer in other seas.

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